SUPPLEMENT.

The Mining Journal,

RAILWAY AND COMMERCIAL GAZETTE:

FORMING A COMPLETE RECORD OF THE PROCEEDINGS OF ALL PUBLIC COMPANIES.

No. 1816.—Vol. XL. LONDON, SATURDAY, JUNE 11, 1870. {STAMPED .. SIXPENCE. UNSTAMPED. FIVEPENCE

Original Correspondence.

DESCRIPTION OF THE ROCK-SALT MINES AND SALT MANUFACTURE IN CHESHIRE.

Rock-salt is said to have been first discovered in Cheshire in the year 1670, in boring for coal; but the manufacture of salt from brine springs appears to have been carried on some centuries previous to this. The Trias and Permian formations have been described as follows—under the Lias—in Cheshire and Lancashire:—

1.—Keuper marls of Cheshire.
2.—Upper New Red Sandstone, or bunter.
3.—Permian—red and blue marls, with limestone.
4.— ditto —Lower New Red Sandstone.
5.—Coal measures.

The rock-salt in Cheshire occurs in the Keuper marls; these are stated to be 200 yards in depth, but the total depth is probably much more than this. There are seven salt mines at present in operation in the neighbourhood of Northwich, named in the order of quantity of rock-salt raised, as follows:—

Name.	Proprietors.
1.—Marston Hall	Mr. W. Hayes.
2.—Platts Hill	Mr. Thompson.
3.— —	Mr. W. Stubbs.
4.— —	Mr. Judson.
5.— —	Mr. Williamson.
6.—Old Marston	Messrs. Fletcher and Rigby.
7.— —	Messrs. Thompson and Jackson.

Besides these there are seven or eight other salt mines suspended. The area of rock-salt that has been proved in this district is considered to be about 4 square miles. It does not vary much in depth, being generally found at 108 yards, from the surface to the bottom of the rock-salt.

The Marston Hall Mine produces upwards of 40,000 tons of rock-salt yearly; this is about one-half the total quantity worked near Northwich. The mine is leased from Lord de Tabley. The lease of mineral was originally within a radius of 7 chains from the pits, and 15 acres in area; this has been increased, the area now amounting to 50 Cheshire acres. The mine has been in operation 20 years. There are two pits at Marston Hall, about 12 yards apart, sunk through the salt beds; the depth is 105 yards to the floor of the bed that is worked. This bed is 14 feet thick, of nearly pure salt.

STRATA PASSED THROUGH IN THE PITS AT MARSTON HALL.

1.—Brown clay					3 yd.	2 ft. 0 in.
2.—Brown soft marl					3	2 0
3.—Brown friable earth, beds of blue marl, and gypsum					38	0 0
4.—Inferior rock salt, not worked	30	yd.	0	ft.	0	in.
5.—Brown metal, or marl stone	5		0		0	
6.—Blue metal, or marl stone	5		0		0	
7.—Inferior rock salt, not worked	15		0		0	
8.—Bed of clean rock-salt, worked	4		2		0	= 59 2 0
9.—Inferior rock-salt	2		2		0	
10.—Hard brown clay.						
Total						105 0 0

The earth at No. 3 is not a marl, vegetation will not grow in it—where found, it is an indication of the existence of rock-salt below. Beds Nos. 4, 7, and 9, are not worked, the rock-salt is intermixed with blue and brown marl. The rock-salt working is generally confined to No. 8 bed. The bed of clay, No. 10, has been sunk into 60 yards in the locality, but not through it, so that the extent of the saliferous beds cannot be said to be fully ascertained until the upper New Red Sandstone is reached.

The shafts for the first 40 yards are secured with timber, and are made 4 ft. square; below that, 30 yards of cast-iron cylinders are inserted, these are of 3½ ft. internal diameter; they were placed after the shafts had been completely sunk; each cylinder is 9 ft. high, the full circle of the shaft; they are bolted and wedged at the joints, and filled behind with cement. By this means the springs usually found at the top of the rock-salt are completed excluded, and the mine is perfectly dry. On descending into the mine the extent and height of the excavation, and the remarkable strength of the rock-salt roof, are the most striking points to a stranger. The bed worked —No. 8 in the section—is generally 14 ft. thick, it is got in two divisions, the top part, 5½ ft. thick, is first got; then the lower part, 8½ ft., is got a few yards behind; these are worked in a continuous face, with pillars intervening at proper distances. Pillars are left 10 yards by 8, with spaces of 30 yards between them, each way. About one-nineteenth of the whole is thus left in pillars; as the working faces extend further from the shafts a larger proportion is left in pillars. Powder is used largely for blasting, about 1 cwt. is consumed daily. The roads at the working face are laid 10 to 12 yards apart, 3 ft. gauge; the same buckets are used on these roads as in the shafts; they are placed on a wooden frame; the frame is fastened below the axles; flanged wheels run on iron bars as rails: sixty persons are employed underground, from 7 A.M. until 4 or 5 P.M. About 20 acres of the 14-ft. bed have been extracted. No timber or other support than the pillars is required. The bed has a slight fall to the east. About 3 ft. of the floor and the same thickness of the roof is being got in two or three places, but the rock-salt is intermixed so much with marl as to be not worth working for general purposes at the present day. The mine is quite dry, great care is taken to exclude water from the works, otherwise it might be better to let them fill up with water, and pump brine from them for the manufacture of white salt. The rock-salt, as worked, contains by analysis 97 per cent. of chloride of sodium (common salt) and 3 per cent. of other ingredients. Its colour varies from nearly white to dark brown. Natural ventilation is depended on in winter; in summer some artificial means is needed to clear the mine of smoke.

The winding-engine at Marston Hall is a 21-in. beam-engine, 4½-ft. stroke, two flat-rope drums, 5 ft. in diameter, on second motion. Two Lancashire boilers, 25 lbs. steam pressure. One rope works to each shaft in front of the engine. Hemp ropes only are used, and one will wear two years, wire-rope would not be at all durable here, owing to the well-known action of salt and water on iron. The same engine pumps surface water occasionally, and drives a circular saw. Recently ingenious machinery has been erected for grinding rock-salt; this is effected by a 16-in. horizontal engine, 3-ft. stroke. The rock-salt is first broken by one of Blake's crushers, from this the material is carried horizontally some distance by an archimedean screw; it is then raised by a bucket elevator, from whence it descends to the grinding rolls. From the rolls the crushed rock is taken horizontally by a screw to the foot of another elevator, by which it is raised to the vibrating riddle; the rock-salt by this is separated into two sorts, rough and fine. The rough is used in the manufacture of copper and in alkali works; the fine, resembling sand, is used for agricultural purposes. A large proportion of rock-salt is sent away in lumps, a better price being obtained for large selected pieces. This is exported extensively to Holland and Belgium, and there manufactured. No white salt is admitted into these countries.

At a short distance from the drawing shafts a shaft is sunk to the rock-salt to the depth of 40 yards. A small engine is erected to pump brine from it by a connecting-rod and T-bob and 6-in. pump; the pump is close topped, and by that means the brine is elevated a sufficient height to run to a large cistern, from whence the brine is run to the evaporating pans as required. There are three pans in operation, 60 by 30 ft. each, for the manufacture of white salt; each pan is heated by four fires. The Marston Hall Works are situated near to the Trent and Mersey or Grand Trunk Canal. There is a branch railway of 1¼ mile to join the Cheshire Midland Railway at Northwich.

Another branch of the works, also belonging to Mr. Hayes, is at Anderton, one mile distant from the mine. There are 16 evaporating pans here, 60 ft. by 30 ft. The works are devoted solely to the manufacture of white salt, from the saline springs, pumped from two shafts in the immediate neighbourhood. The Anderton brine is understood to be fully saturated: it contains 10 times as much salt as sea-water. One gallon of brine yields about 42 ozs. of common salt. The analysis of this salt gives 92 per cent. of chloride of sodium and 8 per cent. of water. The production of white salt is about 30,000 tons per year. Other two companies—the British Salt Company and Darcey and Gibson—have works adjoining to Mr. Haye's, the produce from each of which is about the same as that named. For making stoved or fine butter salt, the brine is heated to the boiling-point—this is 226°. For common rough salt about 160° of heat is applied. For large-grained crystalline salt, for fisheries, the brine is heated from 100° to 110°; no agitation is then produced, and the salt forms naturally in large cubical crystals. There are two shafts, about 20 yards apart, sunk to the brine springs near the works above referred to; they are 75 yards in depth, to the top of the rock-salt. A pumping-engine is erected at the top of each shaft. Each is a 24-inch beam-engine, on second motion. From the second shaft motion is communicated by means of two cranks and connecting-rods to two beams fixed on the front wall of the house; to the outer ends of these beams the pump-rods are attached. There are two pumps to each engine, being 8½ in. close-topped bucket-lifts. The four pumps supply three reservoirs, one appropriated to each work, from whence the brine runs to the evaporating pans. The brine springs are always found at the top of the rock-salt; the pumping operations occasion a great subsidence of the ground, over a much larger area than has been ascribed to the deposit of rock-salt. With every addition of fresh water derived from the surface more salt is dissolved, and thus a continual extraction and undermining is going on, consequent on the pumping. Nearly every house in Northwich may be said to be damaged by undermining, though there is no brine pumped in the immediate locality.

The produce of the Anderton Works is sent away, either by the Trent and Mersey Canal or by the River Weaver, which is navigable to Winsford, seven miles from Anderton. There are five other works near Anderton, where salt is made from the saline springs raised in their neighbourhood, besides eight near Marston, and seven near Northwich; and several at Winsford also manufacture salt from the springs. Notwithstanding the constant demand for this prime necessary of life, and the fresh uses to which it is applied, as in the manufacture of copper, and for agricultural and other purposes, the trade is not in a flourishing state; the production more than keeps pace with the demand, and the produce from other districts has come into competition in the markets where Cheshire salt has been exclusively used. Rock-salt is now sent from Belfast by sea to supply the Newcastle and Glasgow chemical works; this has, to some extent, reduced the working of the Northwich mines.

Salt is manufactured from brine in the neighbourhood of Droitwich, in Worcestershire; this has for a long period supplied a certain district with salt. Staffordshire also produced salt, some years ago, from brine springs, but the manufacture, we understand, has ceased.

COLLIERIES IN THE ASHTON-UNDER-LYNE DISTRICT.

The Fairbottom Collieries, belonging to Messrs. Leeses and Booth, have been before referred to in describing their collieries near Oldham. The Fairbottom Collieries comprise Woodpark, Dock, Rocher, and Broadoak pits, and the Hartshead slope. The Hartshead slope is driven in the Mountain Mine, and has been in operation 26 years, and extended from time to time: its length at present is 840 yards. The dip of this plane is nearly west, 18 in. per yard. A double road of bridge rails is laid the whole of the length, and five wagons, each carrying 6 cwts. of coal, are raised at once, the empty ones descending at the same time, by a double horizontal engine, 22-in. cylinders, 3 ft. 9 in. stroke. The drums are of equal diameter, on second motion. The engine pumps water at the same time; the pumps are worked on the third motion by means of horizontal rods, vibrating pillar, and wrought-iron rods down the slope. There are two 7-in. pumps, the water is raised from the level 540 yards down, and is raised to the level at 250 yards, where it flows off by an adit to the River Tame. Both pumps deliver at this point, and are of the same length —290 yards. Water is also raised from the bottom of the slope by iron tanks at night. There are two Lancashire boilers for this engine; pressure of steam, 45 lbs. About 100 tons of coal is raised per day from the level at 840 yards, and also from levels at 740 and 640 yards down the stope.

The Mountain Mine is remarkable for the thinness of its coal, the extreme hardness of the floor; the coal is excellent for steam and house purposes, its thickness varies from 16 to 25 in. The section is—

1. Grey sandstone.
2. Grey metal ..... 9 ft. 0 in.
3. Coal ..... 1 4 to 2 ft. 1 in.
4. Hard underclay 1 0
5. Soft ditto.

In the coal a seam of Cannel occasionally occurs near the top or in the middle, its thickness varies from 1 to 6 inches. The bed, No. 4, is never drilled; shots are put in the fire-clay underneath.

The Mountain Mine is worked by the rank system; three levels are first driven, the counter level being 4 yards wide, 9 yards of pillar between it and the main horse road, which is 6 ft. wide; a pillar of 2 yards is left between the main and dip levels, the latter is made 16 yards wide, to hold the refuse from the main level. From the main levels jig brows are driven to the rise in pairs 300 yards apart; one is 7 ft. wide for the jig, the other is 6 yards wide. From these the levels in ranks are driven only on one side, 4 yards wide, and 13 yards apart, from their centres. Cross-holes are made between these, at 40 yards distance in the coal only; the rank-levels and jigs are made 3 ft. 2 in. in height, for the wagons to pass, by blowing up the under clay. The range of the jigs is 100 yards to the rise. Only one wagon is sent down the jig at once, on a carriage with a level platform. The coal is brought from each level to the main jig, by which alone it is sent from these different points to the main levels. This is effected by a balance working permanently on one side against the carriage on the other, to six or more different levels. Though it may be said to be only single acting, yet it is preferred on these steep inclinations, and for numerous points of supply, to loose chains at each level. The backs or faces in the coal run in a north-west direction, the bays are worked back on the end, 9 yards wide, and 300 yards in length, commencing at the top level first, those below following a little behind in each case. The main levels are driven to the extremities before commencing to work the coal away. There is no gas produced from the north side of this mine, a little is found on the south side. Candles are used throughout the mine. The furnace is placed 200 yards down the brow, at the bottom of an upcast pit. The royalty at Hartshead is owned principally by the Earl of Stamford and Warrington. There are one or two other seams of coal in the mountain series found on the estate, but much too thin to be worked.

At Broadoak Colliery there are three coal pits, only one of these now in operation. The Black Mine, the upper and lower Bent Mines are worked. The former has been worked by a down-brow 700 yards to the dip, and an engine placed near the bottom of the pit. The coal is worked back to within 100 yards of the shaft. The dip is from 18 to 20 in. per yard to the west; the coal is got on all the seams on a similar principle to that described above. The main levels are driven out to the boundaries first, when the workings for the entire extraction of the coal are commenced, in ranges of 100 yards. The levels and other openings are principally driven wide. The method of working by rank levels is most in favour here; the inclination is considered too great for carrying out the long wall system, though we have seen it in practice with inclinations approaching very near to this. The ascending principle of ventilation is recommended in these steep measures. The air and gases mixed with it ascend by their levity to the highest part of the workings, from whence they may be conducted by an air-way specially provided, to the upcast shaft. There is less tendency in gas to lodge in goafs and form accumulations than in mines comparatively level, the ascending principle acting as an auxiliary to the provided means of ventilation.

In proximity to the Broadoak pits No. 2 Hurst pit is situated; it is 12 ft. in diameter, and has been recently sunk to the Royley seam; depth, 300 yards; thickness, 2 ft. 10 in.; and is being opened out at the bottom. A winding-engine, with two 22-in. horizontal cylinders, is erected, being direct-acting, with round wire-rope drum. No. 1 pit, which is situated a little to the rise of this, is now being sunk as an upcast to the Royley seam.

IRON AND COAL DISTRICTS OF SHROPSHIRE.

The progressive improvement from time to time reported by the public press representing the various coal and iron producing centres of the kingdom has at last become manifest even in Shropshire, known to be subject to those exceptional disadvantages, arising not so much from its position as from the difficulties and cost of obtaining the raw materials common to partially exhausted fields. The Coalbrookdale Company, who it is well known have to labour under disadvantages of the kind, have, nevertheless, by dint of energy and good management, contrived to keep their resources equal to the demand made upon them, and to keep abreast of the times. They are at present, and have for some time past been, busy with machinery of various kinds for the Ebbw Vale Works, of South Wales, more particularly that kind used in the manufacture of steel and other rails; and they are also busy at their Horsehay Works, in the manufacture of plates. The Stirchley Works have increased their facilities for the supply of materials to the foundries, and for the export of the iron, by laying down rails for locomotives. They have erected calcining kilns, and will be prepared shortly to blow in a blast-furnace of very improved make, one lined with the best fire-bricks of the district, and cased with iron. It may, perhaps, be taken as a significant indication of the general improvement that the Trench Iron Works, so long idle, have been brought into the market and sold.

Much interest is just now felt in the question as to the probability or non-probability of an extension of the coal field beyond the old boundaries. Some members of the South Staffordshire Midland Institute of Mining Engineers have expressed sanguine views in its favour, but whether the wish was father to the thought, or whether they came to the conclusion after due deliberation and careful consideration of facts, we are not prepared to say; it is certain, however, that the opinion expressed has led to enquiries for property situated within an easy distance of the coal field on the east. It is but justice, however, to the general public to say that researches in that direction hitherto point to an opposite conclusion, and go strongly to support a negative view. Indeed, scientific facts and careful observation hitherto tend to show that the Shropshire coal field suffered so much at the close of the great carboniferous period by destructive waves as to form, if not an island, certainly a peninsula, on which the ravages of such waves are yet distinctly visible. It remains, however, to be seen whether some lost links hitherto hidden beneath the debris of these and subsequent formations may not yet be discovered at easy distances, either on the east, north-east, or north-west.

Great interest at present attaches to experiments Mr. Corbet, of Adderley, is making by boring at Child's Ercal, near Market Drayton, and to which not only local practical geologists, but the highest scientific authorities of the day connected with the Government Survey have given their sanction. Great praise is necessarily due to Mr. Corbet, and also to his father, Mr. R. Corbet, who has always, or for many years at least, held such views, for putting them to the test; and confidence in the result is increased by the fact that in the person of Mr. Bosworth a well qualified practical borer has been chosen for conducting the operations. Some delay has necessarily occurred, in consequence of alterations made in the machinery, but these being now completed, the works are again in full operation, and a depth

of 638 feet has been attained. This falls, of course, far short of the total depth it will be necessary to go to reach the productive measures; indeed, the whole of what are known as the Permians have not been gone through. Should the valuable seams of the Silverdale or North Staffordshire field be found, the commercial value of the result will compensate the speculators for the outlay and anxiety, and a vast public benefit will be the result. It is seldom that such a concurrence of practical and scientific opinions are to be found in favour of an enterprise of this nature, so far beyond the boundaries of old and well proved mining districts; and the unanimity thus shown may be well taken as an augury of the result.

THE METALS, AND THEIR ORES—No. IV.

SIR,—In the article No. III. (published in the Journal of May 28) the expansion of antimony is by a clerical error stated to be 1-193, it should be 1-923.

Specific Heat, or Capacity for Heat.—If the metals are made to acquire throughout the same uniform temperature of (say) 32° Fahr., and the temperature of each of them is afterwards raised to any given higher standard (say, 212°), it is a somewhat singular, but important, fact that the amount of heat required or consumed in augmenting the temperature varies with nearly every different metal, and conversely, if the metals after being heated to the same uniform temperature are allowed to cool the amount of caloric given off on cooling by each would also be equally different. The amount of heat employed in raising the standard of weight of a metal 1° represents its capacity for heat, and each of the numbers appended to the metals in the following list denotes what is called their "specific heat," and in this table, if 1·000 expresses the amount of heat required to raise a pound of water from 32° Fahr. to 212°, or from 0° C to 100°, that required to raise a pound in weight of the metals in the list to the same temperature will be as under. It is to be necessary to observe, however, that the capacity of the metals for heat increases with the increase of temperature:—

	Specific heat.		Specific heat.
Aluminium	0·2143	Nickel	0·1086
Antimony	0·0508	Osmium	0·0311
Arsenic	0·0814	Palladium	0·0593
Bismuth	0·0308	Platinum	0·0329
Cadmium	0·0567	Potassium	0·1696
Cobalt	0·1067	Rhodium	0·0580
Copper	0·0952	Selenium	0·0827
Gold	0·0324	Silicon	0·1774
Iridium	0·0326	Silver	0·0570
Iron	0·1138	Sodium	0·2934
Lead	0·0314	Tellurium	0·0474
Lithium	0·9408	Thallium	0·0336
Magnesium	0·2499	Tin	0·0562
Manganese	0·1217	Tungsten	0·0334
Mercury	0·0333	Zinc	0·0955
Molybdenum	0·0659	Uranium	0·0619

The metals are, strictly speaking, combustible bodies, some of them requiring but a comparatively low temperature to enable them to unite with oxygen, and to burn, whilst for others to do so it is requisite that they should be exposed to very elevated degrees of heat. The metal magnesium can be ignited at the flame of a candle, and during its combustion throws out a flood of brilliant light, too dazzling almost for the eyes to look upon, being one of the most intensely luminous and splendent flames produced by art. Zinc when heated to redness in the open air burns with a brilliant flame. Iron burns with great energy upon being heated in oxygen gas, and some of the metals take fire spontaneously in the air, or in certain gases, if brought to an exceedingly fine state of subdivision, whilst, on the other hand, others of the least oxidisable, or noble metals—such as gold, silver, platinum, rhodium, irridium, &c.—are only combustible at the highest temperature of the electric lamp, or oxyhydrogen blowpipe. Most of the metals burn with a coloured light, and during combustion and volatilisation impart a characteristic and constant tint or colour to the flame in which they are consumed, thus the flame from copper is green, zinc purple, strontium red, lithium blue, and sodium yellow.

It is to some extent upon a knowledge of the fact that the principle of one of the most wonderful of all modern discoveries—spectrum analysis—is founded, by the amazing delicacy of which not only can the 150,000,000th part of a grain of a metallic substance be detected in our own globe, but the existence of metals in the sun and planets demonstrated and named with as much ease and accuracy as though they were within human reach, many of the metals thus discovered being found to be the same as those existing upon the earth. There are, however, metals found in the earth which have not yet been proved to exist in the sun, and possibly metals may be detected there which are not known of here. It is not within the scope of these papers, nor is it my intention, to enter into a long disquisition upon the physics of light, but neverless a short description of the principle of spectrum analysis may not be uninteresting, seeing that the wonderful and astounding capabilities and resources it possesses will doubtless continue to be largely brought into play in future analytical and scientific investigations. When several metallic substances happen to be simultaneously consumed or evaporated in a flame it is not possible and especially if they are present only in minute quantities or in mere traces, for the unaided eye alone to detect and discriminate between the exceedingly delicate and frequently almost invisible characteristic colours produced by each metal, and scientific aid has, therefore, been brought to bear to assist the sense of vision in distinguishing the metals that may or may not be present in the flame under investigation.

In my next communication to the Journal I shall endeavour to explain the optical principles upon which the discovery of spectrum analysis is based, describing briefly its application to the examination and determination of the metallic substances existing in the earth, and the mode pursued in investigating the composition of the sun and the planets. EDWARD GLEDHILL.

Mining Offices, Shrewsbury, June 6.

METALLIC MINING IN THE NORTH—No. IV.

SIR,—Following up the remarks with which I closed my last letter, I would call attention to that great knot of mountains known, geographically, as the Cumbrian Range, which, occupying part of the counties of Cumberland, Westmoreland, and Lancashire, are estimated to be 50 miles in length by about the same in breadth. The rugged nature of this huge mass may be gathered from the fact that there are no less than 25 peaks, upwards of 1500 ft. in height, scattered throughout the range, four of these attaining an altitude of more than 3000 feet. The geological structure consists of Silurian slates, with protrusions of granite and trap-rocks, having New Red Sandstone along the coast south of St. Bee's Head, and bordered by a semicircular strip of the carboniferous series, on the north and east of the Silurian tract. As may be surmised from the name, Cumberland is the principal seat of this very ancient elevation, whose precipitous and rugged character, intersected by deep narrow fertile valleys, lakes, rivers, waterfalls, and woodlands, form what is popularly known as the Lake Country, the varied beauty of which has become so universally known that it is almost needless to depict the classic ground which is yearly drawing from all parts of the country, and even from across the wide Atlantic, visitors in ever-increasing numbers, to see with their own eyes the landscape which partly inspired and is rendered famous by the immortal genius of Wordsworth, Coleridge, Southey, and many other eminent writers living and dead. Keswick, situated in a charming district, on the River Greta, having lakes Derwentwater on one side, Bassenthwaite at its feet, and overlooked, by the everlasting mountains, the chief of whom, Skiddaw, towers in giant proportion, may be called the capital of this district, to which the tourist generally first resorts, and explores the surrounding country from this convenient centre. To the miner or visitor interested, more especially in the mineral wealth with which Cumberland abounds, pleasure and business can be pleasantly associated together, so that the denizen of the city, while enjoying the pure bracing air, invigorating the body by the physical exertion, and gladdening the mind by the unusual scenic panorama, can also attend to those pecuniary interests without which all human enjoyments must be circumscribed.

From Keswick, then, we may, in imagination, take a descriptive ramble over the district; and, first, it may be noted that immediately in the vicinity of the town, in the hills that rise from and skirt the shores of the two lakes above referred to, there are old levels, in many instances driven a considerable distance, which evince the presence and perseverance of the ancients, the size of and tool-marks on the galleries testifying that the ore must have been in considerable quantity to repay the slow and laborious progress effected by the rude methods then in use. Authentic record of the metallic mines in the neighbourhood of Keswick exist as far back as the reign of Henry III.; they are again referred to in the reign of Edward IV., who granted a charter for re-working the same. Later and fuller information regarding them is given when Queen Elizabeth swayed the sceptre, who, as narrated by Plowden, in the 10th year of her reign, took from the Earl of Northumberland his rich copper mines of Keswick, because of its holding so much silver and gold in the ore; and their valuable character even at that early date is attested by another old worthy, who quaintly remarks, that in taking the rich copper mines from the Duke of Northumberland at Keswick it came to pass that that this Queen left more brass than she found iron ordnance in the kingdom. Thus good Queen Bess, as we are accustomed to call her, on the pretext that they were gold and silver mines more particularly, summarily dispossessed the then proprietor, in a way which, though characteristic of the Tudor dynasty, rather jars on the justice-loving proclivities of modern times. These mines have been here and there re-opened by adventurers in the present century, and the results have in very many instances justified the racy account of their riches given by the old writers, with this remarkable difference, that whereas they speak of copper mainly (perhaps to be accounted for on the supposition that compared with it lead was then of inferior value), modern development has found lead greatly predominant. Indeed, in the Goldscope Mine, about 16 years ago, supposed to be the same from which the large quantities of rich copper ore was anciently obtained, a gallery driven in a westerly direction cut into a north and south lode, 12 ft. wide where intersected, which in the course of drivage increased in places to over 20 ft., producing an average of nearly 4 tons per fathom of slightly argentiferous galena. Some thousands of tons of lead ore was the fruit of this discovery, which, owing to the slight extraction and dressing costs, returned an unusual proportion of profits to the lucky owners. Then there is Yewthwaite, in the same sett, a very productive lead mine for many years past, and at present I believe a good paying mine. At the south-west corner of Derwentwater there is another rich lead and copper mine, called Brandley, which previous to its stoppage had a yearly output of about 300 tons of lead ore, and the formerly productive Barrow Lead Mines, which have been worked extensively on the Yewthwaite lode. These two latter mines have lately been taken in hand by an energetic party, who, judging from their antecedents, will speedily put these properties into a profitable position, as of yore. There is another mine of great promise at Thornthwaite, inasmuch as the Goldscope, Yewthwaite, and Barrow lodes all pass through the sett, with the further advantage that these can be cheaply proved and worked by adit levels, for which the hilly nature of the ground is admirably adapted. A great quantity of lead ore has been obtained in the past from the shallow workings in the Thornthwaite Mine, and there is not the least doubt but that the intended vigorous development of this property will eventuate in results commensurate with the unique facilities it possesses of commanding the lodes of the hitherto three most productive mines in the district.

Many other mines in the district are also worthy of especial notice, but all have been subject to the round of visicitudes which, illustrated in the working, prosperity, and fancied failure when dividends cease for a time, lead to the abandonment of metallic mines, only to be re-worked and prove richer than ever at a future time. The mines in the vicinity of Keswick have proved no exception to this general law, but are at the present time on the eve of entering again on the first stage, the energetic and skilful prosecution of which is certain in a majority of cases to lead to the second; and when it is considered that the railway now traverses the district, connecting with the west coast sea ports on one hand, and on the other, *via* Penrith, communicating with all parts of the kingdom, it is reasonable to expect that coupled with the reduction of dues, which the lessors have of late wisely conceded, these mines thus favoured by important advantages unknown heretofore are destined to attain a success surpassing even former times, the result of which it is to be hoped will postpone indefinitely the recurrence of the third interval of the cycle noted above.—*Caldbeck, June 8.* WILLIAM GIBSON.

MINERAL AND FUEL RESOURCES OF RUSSIA—No. II.

SIR,—In last week's Journal you did me the honour to publish a letter of mine on "The Metallic Resources of Russia." As unusual efforts are now being made in England to increase the commerce between the two empires, and as Russia is at last alive to the necessity of freer trade and more enterprise, it will probably be acceptable to your readers to have their attention directed to the mineral resources of Russia not metallic, and her possession of fuel, necessary alike for the fusion of metals, the carrying on of manufactures, and the conduct of her ocean traffic. Perhaps there is no mineral substance more generally found in Russia than limestone. This is of importance in connection with the manufacture of iron, as lime is a much valued flux. There is a description of lime land very free from sulphuric acid that is more in favour than anything else for this purpose. The importance of this mineral substance in connection with the manufacture of iron is the more apparent from the rude and primitive way in which iron mines are worked—if, indeed, any deposit of iron ore at present known within the dominions of the Czar can be called a mine. With the exception of magnetic, the treasures of this nature known to exist may be called deposits, rather than mines. The ore is quarried out, rather than mined. Where it is not found so as to be removed thus small wells, from 2 to 10 fms. deep, are used to extract it. So cheap is labour, a good workman in the mining districts earning only from 6s. to 7s. a week, that the simplest means and materials are adopted for every purpose. Coal exists very extensively in Russia, although the quality and area are still matters of controversy among geologists and mining engineers. Good black gas coal is not extensively worked; the working of stone coal is very little known in the empire. At Kutai, in the Caucassus, there is a large mine of excellent coal. In the Crimea there is very superior coal. Above Perm, near the River Kama, it is abundant and good; the seams are of vast thickness, lying near the surface, and easily wrought. So little spirit have the proprietors that this field of wealth is scarcely attended to, although in the vicinity of rich deposits of iron ore.

Brown coal is to be found over extensive areas, more especially in Central Russia. In the South large quantities of anthracite are obtained, and applied to many purposes, but very little to the one for which it is so well suited—the manufacture of iron. The basin of the Donetz is as rich in coal as it is better known to be in iron. Eastern Siberia has vast coal fields, which are to some extent worked. The great reason why the coal resources of the Czar's dominions are not brought more into utility is the vast abundance of timber, especially in the iron districts; indeed, the present works scarcely use any fuel but charcoal. The forests are now well cared for by the Government, and the supply is supposed to be exhaustless; but there can be no doubt that if the Muscovite dominions advance in civilisation, commerce, and wealth the forests will be required for building and other purposes, and the great area of coal will be brought into requisition at last. For the iron purposes the charcoal employed is nearly wholly from pine, fir, and birch, but from the first-mentioned by far to the greatest extent.

In Central Russia charcoal is a dear commodity, costing as much as 23s. per ton. There can be no doubt that the expense will gradually advance, even in the North, where it is cheapest, until coal shall be forced into requisition. Russia abounds in clays, and in stone suitable to furnaces. All over Northern and Central Russia there are wide fields of clay, from which some of the best fire-bricks in the world are made. Tinstone is in great masses in the Oural. Close by the city of Moscow, the ancient capital, and still the ecclesiastical capital, of the empire, there are immense quantities of fine stone, especially in the Government of Penza.

In the neighbourhood of the copper mines in the Northern and Central Oural there are deposits of coal, but wood is also abounding, and charcoal is preferred both for domestic and furnace fuel, here as well as in the iron districts.

In the neighbourhood of the Altai, where silver is chiefly produced, there is coal in good quality and quantity, but although timber is scarce, and charcoal consequently dear, the mineral is not worked. Such is the infatuation and want of enterprise displayed, that the silver ore is sent to very great distances to be smelted, while the means of doing that work are at hand, but not in the form that comports with the customs and prejudices of the people.

Sulphur is very abundant, and in almost all districts, from the vicinity of Moscow to the Northern Oural. Until a little more than a century sulphur had been worked time immemorial in the South, near Samara, the ore brought thither from a mountain on the banks of the Volga, opposite the Soka. The mineral lay in huge masses in the sides of the mountain.

It is believed that from a very remote time sulphur was taken from the Southen Oural, but all that exists of it now is a vague tradition, and a very powerful sulphur spring near Sergar. Chrome is obtained in considerable quantities over a large area in the Oural.

Talc, formerly used as a substitute for glass, was once in great esteem in Russia. It is still used in that way in remote places, and up to the time of the Emperor Alexander was extensively patronised for the purpose. Asphalt was worked on the shores of the Caspian 120 years ago, and is still obtained there, but I believe not in anything like former quantities.

Salt is found in very many places, is extensively worked, employs numbers of the people, and supplies a great popular necessity. Russia can supply her 65,000,000 of persons with this great necessity of life in abundance, and of the most beautiful quality.

Petroleum gushes forth in the Crimea, and on the shores of the Caspian, and is greatly prized for its purity.

Alabaster is much appreciated, especially in St. Petersburg and Odessa; it abounds throughout the empire. It is found on the banks of the Oka, Kama, and Volga in veins in the marl.

Steatite, or as it is called in Cornwall soapstone, is easily accessible in the Oural, where it is plentiful.

The empire is well supplied with all the mineral substances necessary for building and public works. Clay for common bricks can be dug up in every direction. Stone can be quarried from the mountain and undulated country. Slate quarries exist less extensively, but the means of making excellent tiles are ample.

For the decorative purposes of buildings, and for statues, tombs, &c., there is some of the purest white marble in the world, in that productive mother soil the Oural, especially in the South. It is not, however, much in request.

Viewing the metallic, mineral, and fuel resources of Russia as a whole, it is no idle vaticination to proclaim that the day cannot be far distant when the Muscovite empire will be civilised, commercial, and affluent. SCLAVE.

MINING IN COLORADO.

The JUNCTION LODE (the east half of), Clear Creek County, has been sold to a company of New Jersey capitalists. The company will commence the work of development on a large scale in a few days. Three pounds of selected ore from this mine yielded at the rate of $7500 per ton. The Junction is a first-rate property.

A visit to the HENRY WARD BEECHER LODE, in Democrat Mountain, will convince grumblers that the solid mineral wealth of the mountains of Colorado is practically inexhaustible. John Cree has been quietly working the Beecher Lode during the past winter. Two feet of solid mineral (argentiferous galena) in the lower level furnishes substantial evidence of the value of this true fissure vein. The workmen are at present running a cross-cut to strike the vein lower down the hill, at which place the outcrop is 30 ft. wide. As soon as the north wall is reached a level will be run west, and the mine thereby placed in complete working order.

Work on the MAGNET LODE, situated on Griffith Mountain, has been carried on all the winter with good results. The ore vein is large and rich. The mine furnishes many specimens of quartz, garnished with native silver.

The work on the CASCADE LODE has been progressing for some time, and a 10-in. vein has just been struck in the main shaft at a depth of 95 ft. The ore is of high grade, containing argentiferous galena, zinc, blende, brittle silver, and native silver. The Cascade will prove its quality this summer by its bullion shipments.

The ore of the COALEY AND GILPEN COUNTY LODES is now treated at the California Reduction Works, and averages about $160 per ton as it comes from the mine, after throwing out the wall rock. The present yield is about 4 tons a day, but when the mines are opened Mr. Cutter expects to average from 6 to 8 tons all the year round. In the bottom of the shafts and drifts, as well as in the west headings, the vein of solid mineral is nearly 12 in. wide. At a moderate estimate the vein of mineral must average 6 in. throughout the present workings. While J. H. Goodspeed was working these mines 45 tons were sold to the smelting company for $16,000—a return which would place the average assay at about $450 coin per ton. The mines have not been worked steadily since they were opened in August, 1867, nor always to the best advantage, but during the times of working about $150,000 have been taken from the ore, or received in payment for ore sold.

Mr. James Wright has a 100 ft. shaft on Claim No. 2, EAST SEATON LODE. He is drifting east near the bottom on a 10-in. vein of first-class ore. The last average was about 100 ozs. of silver, and 1¼ oz. of gold per ton.

An assay recently made by A. von Schulz, on ore from a rich pocket lately opened in the CONSOLIDATED GREGORY LODE, gave 25 ozs. of gold, and 42 ozs. of silver to the ton; it was found in the 200 ft. level east. There is a 3 ft. crevice, nearly solid mineral. The ore is as fine peacock copper as can anywhere be found. The shaft is 450 ft. deep, and shows in bottom 4 ft. of mineral; average assay from the bottom spar, 150 ozs. of silver and 3½ ozs. of gold per ton of ore. In the 100 ft. west level there is a 2 ft. vein, from which the mineral, well selected, assays about 10 ozs. of gold per ton.

The CRISIS LODE, Virginia Canon, Clear Creek County, is now sufficiently developed to warrant it to be pronounced a first-class property. The lode is in character very similar to that of the Seaton, being a mixture of zinc, blende, galena, iron pyrites, and sulphurets of silver. The vein is a strong one, and yields considerable quantities of ore, worth $150 per ton. Work will be continued on this lode during the present summer. The first-class ore will be sold for smelting, and the seconds saved until works suitable for the treatment of what is called in Colorado low grade ores shall be erected. This low grade ore is at last beginning to attract attention. In any other mining country it would be considered high grade. There is an immense pile of it now lying at each of the principal mines in Clear Creek County. At the TERRIBLE and EQUATOR alone there is at least $200,000 worth of ore, which awaits treatment by some cheaper process than is now known here. This coming summer the ore will either be concentrated or treated by some cheap process.

Mr. Charles Water, of Cash Creek, gives the following mining items of that country:—The Yankee Blade Company are crushing ore from the lode of that name, and the yield is most gratifying. They have sent down 200 ozs. of gold to one of the Denver banks, the result of a recent run. The shaft on the HENRY DEPP LODE, an extension of the Yankee Blade, is down 80 ft., at which depth they have struck a very rich vein of ore. The E. M. STANTON LODE, also supposed to be an extension of the Yankee Blade Lode, is turning out some very rich ore. A 2½ ft. vein of ore has been struck in the SPONDULICS LODE, and the ore looks well. Gulch mining has commenced in Lake County. The Cash Creek Mining and Fluming Company commenced work on May 1. Reports from California Gulch indicate great activity among the miners there. The PRINTER BOY LODE, owned by J. Marshal Paul, is proving to be richer than at first supposed. Four pans of dirt from this lode yielded 4 ozs. of gold. Unusual activity prevails among the mines throughout Lake County, and all are looking forward to a prosperous season.

Mr. Dick Irwin, the well-known prospector, arrived in Pueblo on May 4 from the San Luis Valley, bringing with him some very fine specimens of copper ore from a ledge on the side of the Sierra Blanca. These ores yield about 35 per cent. pure metal, as well as a little silver. The ledge from which they are taken is about 300 ft. in breadth, and will ere long be of immense value. Good reports of the success of the Gulch miners at and near Idaho have been received. Mr. Fitzpatrick is averaging about ½ oz. a day to the man. We may expect to hear of large shipments of gulch gold from the lower end of Clear Creek County before the end of the season. W. C.

British and Colorado Mining Bureau.

GOLD MINING IN NOVA SCOTIA.

SIR,—We would call the attention of "A Practical Miner of Thirty Years' Experience" to a paper read before the Society of Arts recently, respecting the Gold Fields of Nova Scotia, in which he will find the points he refers to in his letter in the Supplement to last week's Journal fully met.

Westminster Chambers, June 6. SHELFORD AND ROBINSON.

AUSTRALIAN UNITED MINES.

SIR,—Shareholders of this mine in England, and the mining public generally in Australia, are looking forward with great interest to the development of this property. I am anxious to state a few facts which shareholders would do well to remember, so that they may not part with their shares too readily.

1.—The alluvial soil has been reached in this mine, and found very rich for gold. In Ballarat the average yield for the same space of shaft is 1 oz.—here it is 3 ozs.

2.—In every instance, I believe, where the alluvial soil has been reached and worked good profits have been made, and in some cases enormous dividends have been paid. An eminent colonial writer says—"When the miner reaches the wash-dirt his reward is great;" also—"When at last he touches the gutter he finds wealth."

3.—Several instances of success may be given. In the Sir William Don Mine gold to the value of 62,000*l.* was returned the first year, and afterwards the dividends were 1500 per cent. on the capital. The Redan Company obtained gold to the value of 438,289*l.* in five years. The shares of the Newington Company, 2000 in number, rose to 80*l.* each as soon as the gold wash-dirt was reached. The Bonshaw Company return 400 ozs. per week, and divide 54,000*l.* per year. The Park Company obtain 500 ozs. per week, and divide 60,000*l.* per annum.

4.—The anticipations as to the yield of the Australian United Mines are that gradually it will increase as the drivings are extended, so as in twelve months from the date of discovery to return 1000 ozs. per week. In all probability the incoming mail will bring intelligence of the commencement of the driving, and possibly of some actual results of it.

5.—If this mine should only return 400 ozs. per week (and recollecting, as stated above, that 400 ozs. per week gave dividends of 54,000*l.* per year), that would certainly give a profit of 50,000*l.* per annum, or 8ent. per cent. upon the

capital. Bearing these facts in mind, let shareholders very carefully watch the monthly reports from the mine. One will be due on Monday next, and, in all probability, it will give such information as to warrant the most sanguine expectations.

A SHAREHOLDER.

MINE REPORTS.

SIR,—A great deal has been said of late in the Journal concerning mine reports, and several complaints have been justly made of the vagueness of the statements of some agents on mines of which they have the management. Now, Sir, there must be some reason for such mode of writing: either the writer has not sufficient knowledge of the subject on which he writes, or else he is under the influence of some interested parties, who would manifest their stern displeasure towards him if he wrote anything that would militate against the market value of the mine. In either case you see clearly the object the writer has in view in writing an indefinite and undefined report. If, in the first case, he is careful not to commit himself; if, in the second, he leaves a loop-hole wide enough to make an easy escape should it turn up contrary to his visionary statements.

Now, it may be asked, who is to blame, the reporter or his employer? I answer, both. If a man has not sufficient knowledge of his subject to write a clear, distinct, and definite report, or if his employers wished him to insinuate anything contrary to truth, he should have the integrity to refrain from writing at all, rather than libel himself by doing so in a loose, vague, and indefinite manner. But when a man understands that an unfavourable report brings down upon him the displeasure of his chief supporters (and many apparently good reports would be very unfavourable if faithfully written), it is a great temptation to sacrifice principle for place. Certainly those who thus act towards their agents are more to be blamed than their poor servile captains; and while such unprincipled men have to promote the interests of mining we shall always meet with reports which may be musical in their tone and yet void of sound information.—*June* 9.

A CORNISHMAN.

MINING IN THE NORTH PART OF MONTGOMERYSHIRE.

SIR,—About due south to the Cwm-Nant-Du, the CAYLAN MINE is situated, on the Cae Conroy and Llanerchyraur lodes. It is now worked by Dr. Walker, under the management of Captain Hughes. From the present returns of ore they are able to make profit by it; and, should they extend the workings, as very probably they will in time, no doubt great profit could be made of it. A more promising little mine cannot be seen.

Proceeding westwards, I came across a huge hill, and down again to the RHOSWYDOL MINE, now worked by an influential party of gentlemen from Scotland, under the able superintendence of Mr. Edward Davies, of Dolcaradog. Such an extensive mining sett, with so many productive lodes running through it, I have never witnessed in any place before. I was informed that some of these lodes have produced from 10 to 12 tons of ore per lineal fathom. The quantity of ore that has been returned at such depth from the mine is ample proof of its wealth, without any comment of mine. At this mine I had the pleasure of seeing the first dressing-floors I ever saw—quite a marvel, indeed. They are properly called "the self-acting dressing machinery." The orey stuff is shovelled into the hopper in the ordinary way of doing so, and under the rollers it is classified into many different sizes, and from there it runs into the jiggers, and from these jiggers it is fit for market. All the machinery is of modern invention, and all covered in by a fine building, so they can work without losing time in all sorts of weather, day and night if required. All persons interested in mining should by all means see them in operation, and adopt the system at their own mines, when their trouble with the dressing of ore will be at an end.

The next place I visited was the WEST RHOSWYDOL MINE. This mine has been bought by an influential firm from Liverpool, Messrs. Liscombe and Co. Having been informed previous to my visit that all the Rhoswydol lodes run into this sett. It is marked so, I believe, on the plans issued with the prospectuses. I only took the bearing of the northern and southern lodes, as I knew through experience that the middle lodes must follow. If I am correctly informed, there are seven lodes falling together within the boundaries of this sett, forming, of course, at least six junctions. I may add, however, that I have seen six lodes pointing towards the Cae Conroy lode (so called), and when the cross-cut now in course of driving shall intersect the lode they will, no doubt, then drive east, and will find all the junction of lodes before them: what the result will be I shall leave practicals to judge. I will only beg to say that I have a great faith in such an event. They worked about 15 or 16 years at the Van before anything of note was met with, and I believe that the last years' profit was more than ample to reimburse the expenditure during that long period. May I ask all practical miners whether it is possible to find another such course of ore as that at the Van? I, for one, think it is probable, if not more than probable, where there is undeniable proof of so many strong, well-defined, and productive lodes coming together, and that in one of the first mining districts in Wales.

May 25. G. L.

BRONFLYOD MINING COMPANY.

SIR,—My attention having been recently drawn to a notice in the Journal of May 28, wherein my recommendations to this proprietary are styled "novel" and "expensive," you will permit me to state that although the mode of accomplishing the object of our recent meetings may appear to the writer to be "novel," it is, nevertheless, effective in securing an equal contribution of that we require for the purpose of developing new and important discoveries in the eastern and western portions of our property.

Six-sevenths of the old proprietary of Bronfloyd had some experience of the fallacy of trusting to voluntary equities last year, when a surrender of half the shares was proposed to be made by each member at 2*l*. per share, with a view to the introduction of the mine on the market; and the subsequent division of the 1000 shares into 12,000. This surrender was intended to be, and ought to have been a *pro rata* contribution, because by it it was anticipated, and it so resulted, that the remaining moiety of the shares would thereafter realise as much money as the entirety before the arrangement. One-seventh in number of the members, holding one-third of the shares, stood aloof; the compact, so curtailed, nevertheless, went on; the price advanced, as I expected, upwards of 100 per cent.; and those who stood out then have since sold, or are now offering for sale, their shares, reaping, of course, a double advantage, or thereabouts, over the contributing six-sevenths.

Thus, you will see that the "novelty" of our proceedings was simply a means to an end—the compulsory equality of contribution towards the company's wants. To have increased the capital of the old company by 5000*l*. would have been a much easier operation, and would have entailed much less personal trouble; but then there might have been a like want of reciprocity, and an inclination not to subscribe. Consequently, "winding-up" and "re-constitution" was the only resource; and, as to the expense, such will not amount to one penny per share.

The authorship of the "novelty" was admitted at the outset; and its adoption has been as marked as it is gratifying (one dissentient out of 236 members); proving this fact, that we value the present divided shares at a much higher figure than the quotation of your correspondents, although perchance they might hope to see a reduction brought about by the notice. Bronfloyd is not a mine of yesterday, it will hold its own irrespective of such like notices; it has already paid twenty-six dividends—and the July one will be 1000*l*. on 20,000 shares, which, as compared with July, 1869, is an increase of more than 13 per cent. per annum, and 23 per cent. per annum in excess of the corresponding quarter of 1868.

Our present workings realise now about 4000*l*. a year; by this "novelty," and without entrenching upon those profits, we have 8000*l*. available for developing new ground, of which we have nearly a mile untouched on the run of two of the finest lodes in Cardiganshire.

J. B. BALCOMBE,
Bryn-y-Mor, Aberystwith, June 9. Managing Director.

MINING IN SHROPSHIRE—THE WEST STIPERSTONES LEAD MINING COMPANY.

SIR,—The perusal of the report of Capt. Arthur Waters (manager of Tankerville) upon the West Stiperstones Mine induced me to subscribe for shares at the time the company was introduced to the public. Knowing the deservedly high position occupied by Capt. Waters, it was sufficient for me to find that he had made a statement to the following effect with regard to the West Stiperstones:—"That the property is not only well situate in relation to the productive rock, but as to the run of many of the very prolific lodes of the locality, and that the whole of the Pennerley, the Old Bog (Stiperstones), as well as the Roman veins (each of which has yielded immense wealth, and is at present producing large quantities of ore) run directly into West Stiperstones." To this important statement Capt. Waters added that "West Stiperstones holds a position in zone No. 3 analogous to that occupied by the Old Snailbeach in No. 1 group." These statements are sufficiently satisfactory to my mind as to the real value of our property; but I think the shareholders have a just cause of grievance against the executive for keeping them in the dark as to the progress that is being made with the necessary preliminary works. It is very well for Capt. Waters to tell us that "he has had a high opinion of the sett for years, and believes that 1000*l*. judiciously expended will lay open a profitable mine," but if he does not tell us what progress is being made in that direction those who make it their business to keep themselves informed upon such points (and by means not open to the general body of shareholders) may be quietly "picking up" the shares from others who are oblivious of the condition of things at the mine. The remedy is obvious. Let Capt. Waters, as in West Tankerville, furnish a periodical report for insertion in the Journal, and then every shareholder will be placed upon the same footing.

A SHAREHOLDER.

June 8.

THE PEN'ALLT SILVER-LEAD MINE.

SIR,—In last Saturday's Journal a letter from "J. B. H." professes to give information touching the Pen'Allt Silver-Lead Mine, and seeing the positive statements he makes as to the future prospects of that mine, one cannot but feel how much more satisfactory it would have been had he given us his name. A man's capability to predict, and the reliability for what he says, is challenge at once when we know who is the author; but the non-responsibility, shielded behind simple initials, often makes a man reckless and regardless as to his facts, and unscrupulous as to the taunts he flings in the teeth of others. "J. B. H." falls foul of a Mr. Henry Sewell (of whom I know nothing) and of a mine called Dyliuan (of which I never before heard). Mr. Sewell seems to have written a letter, and the opinions expressed in that letter seems to have given great offence to "J. B. H.," who talks about his having "damned with faint praise" Pen'Allt. Well, be that as it may, he does not shrink from giving his name. What I contend here is, that "J. B. H.," who does not give it as his opinion, but positively asserts that the directors of Pen'Allt, by the end of September, will be able to pay a dividend. I say he should uphold this assertion with his name. If this be so, and he has the interests of the mine at heart, let him declare himself, and face the responsibility, for good or for evil, of inducing me and others to take shares in "a sound undertaking such as Pen'Allt." I am no miner, but I have money invested in mines, and am anxious to invest more where I have faith, but I do not think faith is to be created by making anonymous statements, and inviting the uninitiated to visit the spot, "and see for themselves whether I ("J. B. H.") have stated facts or not."—*June* 6.

SCRUTINY.

[For remainder of Original Correspondence, see this day's Journal.]

Meetings of Public Companies.

GOVERNOR AND COMPANY OF COPPER MINERS.

The adjourned meeting of the annual general Court of proprietors was held at the Terminus Hotel, Cannon-street, on June 1,

Sir MACDONALD STEPHENSON (the Governor) in the chair.

Mr. FREWER (the Secretary) read the minutes of the meetings of April 7, 1869, November 17 and 24, 1869, and April 6, 1870, which were confirmed and adopted by the meeting.

The report of the Court of Assistants was taken as read.

The CHAIRMAN: Gentlemen, in proposing the adoption of the report I shall best consult your wishes and convenience by limiting the few remarks I have to make to the more salient points to which alone it is necessary to direct your attention. You will all have read with very great interest the full and exhaustive reports of the professional gentlemen who have been requested to investigate the position and prospects of the undertaking, and who have so ably and effectually performed the duties they have undertaken. I should mention that some few clerical errors have been pointed out and corrected by them since the report was in print, but they are immaterial, as they in no way affect questions of principle. The Court regard these documents as affording the text and basis of such modifications in the existing arrangements as hold out a fair prospect of restoring the prosperity of the company. Gentlemen, I believe there is but one opinion existing amongst us, and that is a very decided one, that it is impossible to continue in a course which year after year disappoints the just and reasonable expectations of the shareholders, and adds loss to loss, until the arrears of the preferential claim now exceed 190,000*l*. (Hear, hear.) The main question, indeed almost the sole question, for your consideration is the best and most effectual remedy for this acknowledged evil. As sensible business men, the shareholders referred that question to a committee, the practical results of whose recommendations is the series of exhaustive reports now placed before you. It will be satisfactory for you to know that the entire cost of those investigations has been within 700*l*. The carrying out the principles and dealing with the details referred to in the reports are matters which will necessarily rest with the Court, and they must exercise a sound discretion in the matter. I may add, upon my own conviction, that the task is not an easy one, that it will involve considerable labour and unceasing watchfulness, but if steadily persevered in, and energetically followed up, there is every reason to anticipate favourable results. It rests with the proprietors, therefore, to take the next step, and if the present Court still retain their full confidence to leave in their hands the action to be taken to give effect to the recommendations which have been made. If, on the other hand, the proprietors have any reason to be dissatisfied with the present Court, and if from any cause whatever they think their interests will be better promoted, and the necessary changes in the arrangements can be more effectually carried out by others, I wish it to be clearly understood, on my own part, and I am authorised with the entire concurrence of all my colleagues in saying that we shall readily and cheerfully make over our charge and responsibility to any gentlemen approved of by the proprietors who will undertake and relieve us of these responsibilities. Gentlemen, I have purposely abstained from occupying your time with the details usually discussed at ordinary meetings, as irrelevant on an occasion when so much more serious and important matters require your earnest consideration, and upon a right decision of which entirely depends the hope and probability of extricating the company from its present position, and of restoring, to some extent at least, its normal prosperity. I shall not trespass longer upon your time, but at once propose that the report of the Governor and Assistants be received and adopted, and entered on the minutes.

Mr. JOHN HARMAN (Deputy Governor): I beg leave to second the resolution.

Major STEWART: I would beg leave to offer an amendment to that proposition. It is now, I think, nine years since the last real dividend was paid. During those nine years we have received one dividend of 5 per cent. and one of 7 per cent. It is enough to make one look very coolly, not only at the Manager but at the Court of Assistants, because really there must have been faults somewhere, for such a loss could not otherwise have taken place. Have the Court of Assistants been negligent in attending to the works and superintending Mr. Struvé? Or has he been negligent in superintending those at Cwm Avon entrusted to his charge? Now, in looking through the report which we are now called upon to receive, it would appear that there have been faults on both sides. But, in the first instance, my proposition is that, instead of acceding to your motion, Sir, I suggest that the accounts be returned, and the Court of Assistants be requested to have them made out in a more full and complete manner, showing the profit and loss under the three heads of iron, copper, and tin, and also other outgoings and incomings of what nature soever, and that those be forwarded to the shareholders with the least possible delay, and that such fuller form be continued for the future. Now, gentlemen, we have been in ignorance for years as to whether iron, copper, or tin were profitable—any of them; or whether any of them were a loss. From a report made by the Court of Assistants, some few years ago, in which they stated that copper smelting abroad interfered greatly with the smelting at home, I had been led to suppose that copper had been our great loss. In a late report, one or two years ago, the Court of Assistants stated that they had at one time in serious consideration whether they should not give up altogether, or reduce considerably, some of their works. I supposed, from what I had previously seen, that that would be copper; but when I come to find what are the earnings upon our copper and tin during these nine years I find I must have been in ignorance, and that that was probably with reference to iron. Now, if the accounts had been rendered as I think the shareholders have a right to see them rendered—and, indeed, in the report of these four gentlemen they speak of their not being rendered because there is nothing to learn from them, unless it is the loss sustained, and perhaps, consequently, some charge against the Court of Assistants and Mr. Struvé—I cannot see any objection to rendering the accounts in that form. Many persons, in writing to me, have complained of the kind of report which is really keeping them in the dark. I addressed, as you know, a circular letter to the shareholders, and, though I did not ask for it, some of them nevertheless have forwarded some remarks. I am not in the habit of having recourse to strangers, but under the circumstances here I must have as much confidence in a stranger as I have in the Court of Assistants. I must not occupy unnecessarily your time, and I will put that into your hands, that the accounts be returned, and not adopted, but that they be made out in a more full and complete form, and forwarded with the least possible delay to the shareholders. I hope that some one will second my motion.

The CHAIRMAN: Does any gentleman second that amendment?

Mr. MONTRESSOR: I will, for want of anybody else. I should like to have the accounts in a more full form than we have at present.

Mr. BRAITHWAITE: Mr. Chairman and gentlemen—

The CHAIRMAN: Are you going to speak to this amendment?

Mr. BRAITHWAITE: No, it is not necessary that I should do so, but I may say with regard to the amendment, knowing as I do the desirability of not unnecessarily exposing our proceedings to the public, I should not be prepared to vote for the amendment; because I think the source of our prosperity does not depend upon a greater amplification of the accounts. It goes beyond that. My object in rising is to state some principles upon which I think the source of our prosperity does depend. I should be very glad to support the resolution put forward from the chair—that is, to simply adopt the report; but the fact is that this report is a very extensive and important one, and comprises a number of questions. I have reckoned no less than eight, and there are probably more, if it is carefully examined. The first suggestion which is made is a very important one, and that is a re-arrangement of the leases. The second suggestion, which is repeated twice over, is that there should be more co-operation between the London board and the manager at Cwm Avon. Then, the third recommendation is one which calls for great consideration, that is the conversion of the company into a limited liability company, and getting rid of the distinction between the two classes of stocks. Then, there is a proposition, which is the most important perhaps, of all the suggestions in the report, and that is to have a common store, and sub-managers of each department. Then, there is a suggestion made to spend some 8000*l*. in improving various portions of our property. And there is a further suggestion, as to adopting the narrow gauge upon some 3½ miles of road. Such a general approval of the report as has been moved leaves one in the dark as to whether or not these suggestions are going to be followed—whether any or all of them. I think we ought to have a more distinct explanation from the chair as to that matter. Now, to my mind the most important of all the suggestions is the suggestion with regard to management. (Hear.) I was not able to be present at the last meeting, but I understood that the committee which was appointed recommended that the manager at CWM AVON should be placed in a more independent and responsible position. (Hear, hear.) I do not remember the words of the report, but in the proceedings of the last meeting I do not find any allusion to that recommendation, nor in the speech from the Chairman do I hear any allusion to it now, but from what I know of other concerns, and from what I have heard from gentlemen more intimately acquainted with the manufacture of iron, and matters of that kind, the question of the management is all important. It is the opinion of the most practical men that you should have a manager who is capable of superintending the whole of the works at Cwm Avon, and that the responsibility of the manufacturing, and everything connected with it, should be entirely on him, and that to attempt to manage the works from London, although you may have a very able board, as I have no doubt you have, would be practically of no use whatever, but it would only end in disappointment. The responsibility, therefore, should be thrown upon the manager, who if he does not act properly should be dismissed, and a fresh manager of sufficient intelligence and energy should be obtained for the purpose of occupying his place. That is so important, and really the crisis at which we have now arrived in this company is so imminent, seeing that the preferential shareholders have been kept out of their dividend for ten years, that unless the Court makes some definite recommendation upon the subject I should suggest that a committee of shareholders should be appointed to take this question into their consideration, and to report at a subsequent meeting. I shall wait to hear what the Court have to say, but unless some definite proposal is made that is the course which at present I think it would be best to take.

Mr. BEATTIE: Mr. Chairman, I should have been very glad indeed to have been one of those to support the motion which you have just made, and which has been seconded by your colleague, but I agree with my friend, Mr. Braithwaite, in thinking that it is premature to pass a resolution of that sort until we know what is intended to be done with regard to the recommendations of the professional gentlemen who have been employed to investigate the state of our affairs. The real fact is this—When I had last the opportunity of addressing the shareholders I pressed upon their attention, and upon the attention of the Court, that the question of the management at Cwm Avon was, in my judgment, the cardinal point in the affairs of the company, as the cardinal blot hitherto has been the divided management between London and Cwm Avon. I pressed that, and hope I did it in the most courteous manner; but I have done it urgently and distinctly, both privately and publicly in this room, and, unless I hear from the Court that they are now prepared to accept the recommendations of the report in that particular, I am unable, Mr. Chairman, to support your proposition. That is what I have to say with regard to your resolution; but, with regard to the amendment which the gallant gentleman has proposed, I agree with my friend, Mr. Braithwaite, that a more full and ample statement of the accounts, stating our profit and loss, and bringing more distinctly forward the operations of the year, will not remedy the present state of things. What I mean to say is, if the gallant colonel knew as fully as I do the details of the accounts of the company I think he would be no wiser in that respect than he is at this moment; but I think he must agree with me that a divided management of a manufacturing concern is entirely wrong. Now then, gentlemen, I ventured to express that opinion, as you all know, before, and, without detaining you by repeating what I said before, or by reading the reports on that point, I think you will agree with me that the professional gentlemen concur in that opinion. The reports are very short, and I should like to show you that they do concur in that opinion. Now, the most essential of these recommendations, as it seems to me, of Mr. Phillips is that there should be a more cordial co-operation between the London management and the manager at the works. What he says is this—First, That a more cordial co-operation between the London management and the manager at the works is very desirable, and would result in a regular and better selection of furnace materials." That is, in other words, precisely what I put before the shareholders at the last meeting. There is one other point to which I wish to direct your attention, and that is the determination of the Court to appoint sub-managers themselves, and send them down to the works to supervise the various departments, conducted with skill and energy by intelligent workmen.

The CHAIRMAN: And profit?

Mr. BEATTIE: But, instead of listening to or waiting for the report, I am told that an advertisement was put in the *Times* newspaper for a sub-manager, and various other exertions have been made to obtain a sub-manager. I think that, having appointed these gentlemen to give you an opinion on the subject, it would have been better to wait until you had got that opinion. Now, what is their opinion upon that subject? I will give it you: it is at p. 50, very near the foot—"We are further of opinion (this is the joint report, mark you) that if copper ores and regulus or tin be purchased in London it should be with the knowledge and concurrence of the works, and that oils, stores, timber, pitwood, and small stores generally should be bought by the works as they may be required. Various foremen and heads of departments may, in our opinion, be practically regarded as sub-managers, and we do not recommend the appointment of any additional officers beyond the engagement of a skilful analytical chemist, as we presume that the Court will prefer to retain the heads of the coal, iron and copper, and tin-plate departments." This is exactly confirming the recommendation which I hope I respectfully made to the Court a few months ago. All I say now is that if the Court is not prepared to act upon that report, and act upon the real practial question existing—that is, whether you shall charge the manager at the works with complete responsibility, and make him responsible for all the ores that he smelts, and the whole conduct of the concern, I do not think you will ever be able to do any good. Anybody connected with business must know that you cannot manage works of this kind up in London, where you would only be conducting it by those who must, from not being on the spot, be unacquainted with the subject. Gentlemen, I hope you will forgive me for having repeated the arguments I used before, and I do hope, Sir, after these reports that you and your colleagues are prepared to accept these recommendations, and thereby to turn over a new leaf.

Mr. TALBOT: Before the amendment is proceeded with I should wish to make a few remarks upon it. I think the amendment will hardly meet with support, for, speaking for myself, I do not think it meets the difficulty of the case. The difficulty is, what is to be done at Cwm Avon? but the matter as to the manner of keeping the accounts is all matter of opinion. What I want you to-day to consider is the management at Cwm Avon. If you turn to p. 42 of the report you will see what the gentlemen employed to report at Cwm Avon say upon the subject. They specify the comparative advantages and disadvantages of the works at Cwm Avon, and then they go on to say—"No commercial undertaking, however weighty its collateral issues may be, can, it is plain, continue to be maintained for any great length of time at a loss or without a profit, and it is proper that everyone at the works should understand that without increased economy of production, which is only to be accomplished by increased economy and greater vigour in every detail of every department, the existing arrangements cannot be continued; and the letter of instructions given by the Court to the manager on his appointment, and the general tenor of the correspondence which has since taken place, show that the Court have invested him with the full powers necessary to carry on the operations of the works in the most effective manner. The cause of any deficient prosperity must, therefore, be sought in some other circumstance than an undue interference with the manager's arrangements, and we attribute it to a chronic supineness." If that is the case, you ought to enquire into it, because if there is this drowsiness and supineness it is no use keeping the accounts in a different way—that will not help the matter. "The cause of any deficient prosperity must, therefore, be sought in some other circumstance than an undue interference with the manager's arrangements, and we attribute it to a chronic supineness which has been allowed to grow up in every department, and which it will require vigorous and energetic measures to undo." Gentlemen, I have read the reports very carefully, and I may say I agree with almost every word these four gentlemen say; but I do not agree with that joint report, and I cannot see how gentlemen who report separately in one manner can report jointly in a different sense. For in the report of Mr. Macdougall Smith he says, at p. 10—"The development for winning and working this coal field is gradually progressing on the carefully studied and comprehensive plan designed by Mr. Struvé, which I am sure will facilitate the economical working of the coal to a greater depth, and at less cost, than could be obtained by any other new openings; by vigorously pushing forward this plan I believe a much better and more marketable quality of coal will be sooner obtained than by any other means." He then goes on to say—"I believe a better and more marketable quality will be obtained sooner and at less cost by vigorously pursuing the plan designed by Mr. Struvé for winning the coal field on the east side of the Pennydd Fault, whereby the concentration of the workings, both underground and on the surface, the drainage, the ventilation, and the haulage underground by machinery introduced as far as practicable, will all combine to greatly facilitate the economical raising of coal more marketable than that that now produced." He says further on—"I cannot close this report without expressing my entire satisfaction with the complete manner in which the whole of the work connected with the new winnings on the Finery, the Upper Four-feet, and the Big seam has been laid out; and, although it necessarily absorbs a large outlay of capital, I am sure this expenditure will secure future economy in the course of production." That is the opinion of Mr. Macdougall Smith, and you will see that he does not say a word about drowsiness, sleepiness, or supineness on the part of anyone—in fact, the report is, I consider, a report of congratulation. Then, gentlemen, you go to the report of Mr. May, upon the subject of iron, and you begin with the coke-ovens, at p. 15, and he says—"The ovens are in a fair state of repair, and, so far as their capabilities extend, are, I consider, working economically." Then he says further on—"I have compared the accounts of the calcining, and find the coal employed is quite as little as in any other works." Then he says, at p. 16—"The quantity of coke employed, compared with the yield, was from 27 cwts. to 32 cwts. per ton of pig produced; this, considering the height of the furnaces, the temperature of the blast, and the soft nature of the fuel, is a good result. I consider that the furnaces are well managed, and, for their construction and attendant circumstances, as much made out of them, and at as low a cost, as it is practicable." Then, as to the iron-mill, he says—"I find the rates quite as low, and in four instances lower, by about 8 per cent., than that paid in other works in the locality. I find the coals consumed in the puddling and mill furnaces to be only 4 per cent. above the general average, and, when the quality of the fuel is taken into account, this is a fair result." Then, gentlemen, there is only one other matter connected with the manufacture of iron, and that is the limestone. He says—"I consider that the limestone is of good quality, and is paid for at a fair price." Then he says that there are proper means of conveying the materials to the furnaces, and that no undue amount of labour is brought to bear. Therefore, that report must be considered as a most favourable one. He suggests alterations in the mode of manufacturing iron; but all who have been familiar with the make of iron know that the improvements which have been applied with such success in Yorkshire have not been applied to the district of South Wales. At the same time, if you like to go to the expense, and try the experiment, I must confess that I should wish to see it attempted. I do not see why Yorkshiremen should have it all their own way. Now, gentlemen, we come to the report upon the subject of copper, and we read, "If a comparison be instituted between the copper works at Cwm Avon and other similar establishments it will be found that they are not only as well arranged as the majority of them, but also that the system employed is in all important particulars the same. The cost of labour is also in accordance with the usual scale adopted in other copper works, and the expenses of technical management are by no means excessive." Then further on we find, "It will be gathered from what has been stated that the Cwm Avon Copper Works are not only well laid out, but also as far as the existing system will admit of, they are skilfully and efficiently conducted. In order, however, to ensure the best possible results, it is suggested that certain changes would be desirable, and

that some modification with regard to detail should be introduced." Now, gentleman, after these reports is it fair to say that these works have been carried on drowsily, more especially when we find in another part of the report that so far from its being the fact that the manager is sleepy, it is the proprietors themselves who are not embarking their capital in the new improvements which are gradually superseding the old kinds of works? Then there are one or two other points I should like to call your attention to. I see in one of these gentlemen's reports upon the subject of railway communications, at page 31, Mr. John Bourne says what he has to say on the subject—"Should the railway company decline to make the extension from Briton Ferry to Port Talbot, then I think it would be well worth the while of the Cwm Avon Company to lay down a single line of narrow gauge themselves, the ground being quite level, and presenting no engineering difficulty of any kind to the execution of such a work." That belongs to the Great Western Railway Company. I am a director of the Great Western Railway Company, and I not aware that they would allow another company to lay down a line of railway on their line, even if they had the power to do it. I might here mention to you what I do not think has been stated before. Some time ago Mr. Struvé mentioned to me the great advantage which it would be to this company to have one carriage running on to Neath, and there transporting the goods to London, and to all parts of the world. Upon that I brought the matter before the directors of the Great Western Railway. At that time money was extremely dear, and the railway company being short of money the directors said they could not do it. I then offered to lend the money myself at 4½ per cent. An engineer laid out the line, and the estimate was 13,000*l.* for putting down the third rail. But when everything was arranged, and indeed when the sleepers were bought, I made a discovery. I found that this company had bound themselves for a term of years to send the whole of their produce to London by another route.

The CHAIRMAN: It is an annual engagement, and a cheaper route.

Mr. TALBOT: That is what I was told at the time. I am a large shareholder in the London and South-Western Railway Company, and I applied to my old friends, and said is it fair to carry away the traffic? They knew nothing at all about it; they said they did not make the bargain, but that the Somerset and Dorset Company had made the bargain. I then went to the Great Western Railway Company, and informed them that even if a narrow guage was laid down they would not get your traffic, and that is the reason why the narrow guage is not laid down, but it will be laid down at any moment you can assure us of your traffic. You are at present, however, doing the whole of it for a less price than we can afford to carry it at in one loading. It is needless to tell you, Gentlemen, that somebody must lose money by that bargain, but we lose it for the Great Western Railway Company, at all events. Gentlemen, I will say one word with regard to one or two remarks made by these gentlemen in their joint report, because I am bound to say I do not agree altogether with what they propose. They propose at page 43 a sort of central office for stores—that is, that the stores should be a department by themselves. Now that seems to me to be an extremely ingenious invention, but anybody who knows the character of the business will comprehend that that will be perfectly impracticable. If you will allow me, gentlemen, I will give you an illustration of how it would work. They say here "the coals supplied by the mines to the store, and by the store to the departments, would be charged at different rates for the small and large, and for different qualities, in the same way as would be done if sold to the general public, the whole spirit of the proposed arrangement being to terminate the existing laxity, and compel activity and economy, by making it incumbent on each department to look keenly after its own interests, without which it would be unable to show a profit, failing which it would have to be discontinued, or the manager of it suspended." Coal being one of the stores, I am to suppose that the copper smelter purchases 500 tons of coal. The manager is dissatisfied with the quality; he has the power of rejecting it, and he will not have it, and the inevitable consequence of the arrangement as proposed would be that they would be left on the hands of the manager, and the unfortunate manager would have 500 tons of coal on his hands, for which he could find no use, and the same would be the case with everything else. For, gentlemen, if I had the power of rejecting coals which I did not like, I should take the benefit of that for my own department, and not care about anybody else; but it makes no difference to this company whether the price is charged on one man or another. We shall have to pay for all the coals that are received. Now, gentlemen, it is said here that 6s. 6d. or 6s. 9d. is the price of coal at Cwm Avon. Gentlemen, I have a large colliery, though, indeed, not quite so large as that at Cwm Avon, and I may tell you the cost price of my coal is 6s. 6d. a ton, and the proprietor of one of the largest establishments at Merthyr Tydvil, an eminent friend of mine, who is not at all fond of telling these things, said it cost him 7s. 6d. a ton, but I admit to you that it is of a much better quality. That is the weak point which is mentioned here—its bad quality. Gentlemen, I cordially concur with the remarks which have been made by the former speaker. I do not think there would be any use in moving an amendment to the resolution which has been put by the Governor, but I do think that the Court should take into consideration the recommendations made by the gentlemen, so that the proper objects of the report may be thereby gained. There is a most remarkable fact, which comes out at page 48, with reference to the profits of the nine years during Mr. Struvé's management. I know that it is always dangerous to argue *post hoc propter hoc*. My own opinion is that a great many causes have existed for the difference between the years of Mr. Gilbertson's management and Mr. Struvé's, but I have known both Mr. Gilbertson and Mr. Struvé for a great many years, and I have the highest opinion of both of them. I have recommended them both for the Commission of the Peace of the county, which I think shows my appreciation of them, and I do not impute any fault to either, but I do think the different characteristics of Mr. Gilbertson, who was brought up as a solicitor, and Mr. Struvé, who was educated as a civil engineer, have had a material effect on the result which we see here. Now, for the first eight years the average profit was 27,000*l.* a year. In the nine years under Mr. Struvé's management the profit has been 1182*l.* No doubt, gentlemen, the greater part of that is due to the badness of trade generally, but the difference between Mr. Gilbertson and Mr. Struvé is that Mr. Gilbertson would not be bullied. I have seen frequently his indignation at being treated as he was, and he has often told me that all the money which was made at Cwm Avon was lost by the board in London. Mr. Struvé has never told me anything of the kind, but without asking the question of him I can understand perfectly well that he would be able to make a dividend for the company, but he cannot under the present circumstances, and my firm conviction is that if Mr. Gilbertson had continued at Cwm Avon he would have made a profit for you. I do think that you should have the greatest possible confidence placed in your manager. What sort of a profit would a railway have if they did not place entire confidence in their railway manager? It is the universal rule of such undertakings never to interfere with him. But if you do interfere with him one of two things will certainly happen; he will lose money, or he will excuse himself. If a gentleman had a farm of 2000 acres a few miles from London, what chance would a manager have of making money if the gentleman who resides in London managed it from there? The whole thing would necessarily go to the wall. I ask you, gentlemen, to have the amplest confidence in your board, but I ask the board, on the other hand, to have the amplest confidence in their manager. If you make it the business of the manager to show a dividend, he will do it. That is my opinion. I know that there is a great deal of difference of opinion upon other points, but I have not heard a single contradiction to the suggestion that he ought to be entrusted with the entire management. If you will have the proper confidence in him he, I am sure, will do all he can; he will strain every nerve in your interests, and instead of a loss the concern will from this moment produce a profit to the proprietors. (Cheers.)

Major STEWART: I do not know whether I am right in speaking again, but the gentlemen have quite run away from the question before them if they intended to make their observations on the amendment. I understood that the report was not before us.

The CHAIRMAN: I ought, perhaps, to have stopped them, but the subject is one of so great an interest that I thought you would desire to hear all that could be said upon it. Perhaps you will now let me put your amendment.

Major STEWART: Would it serve the purpose if, instead of making the amendment apply to the present account, it were simply to be moved as to future accounts?

The CHAIRMAN: We have endeavoured to make them fuller than they have been.——Major STEWART: Yes, that is so.

The CHAIRMAN: If you can leave it for the future we will attend to it, but the reason why the accounts are not fuller is that it is deemed unadvisable to give an unnecessary publicity to the details of the working of the company.

Major STEWART: I do not want improper particulars. I will withdraw the amendment if you will attend to it in the future.

The CHAIRMAN: Gentlemen, Major Stewart has withdrawn his resolution, and has handed me a form of account, which he thinks is much fuller, and at the same time more acceptable. In the interval between this and the next meeting we will ascertain how far it may be practicable to adopt his suggestions.

Mr. CREWDSON: Gentlemen, I listened with a good deal of interest, but at the same time with some consternation, to the early part of the speech of Mr. Talbot, because going through the report that has been made by the professional gentlemen who have been employed, he spoke in terms which I really do not think are deserved, but which were terms of great praise of the management during the time we have not got a dividend. We have not had a dvidend, and we are driven back to consider the cause of it. Now, during the eight years of Mr. Gilbertson's management we had a dividend, and during the nine years since we have not. We are, therefore, driven back upon the profits which were made during the former years, and the loss which you have now been under for nine years. Now, that is a very unfortunate condition of things, because if this company can only make a dividend in exceptionally good years it stands in a very bad position indeed. Now, the remedy for this evil which is suggested is that the manager should have more power and responsibility placed upon him, and the *onus* of making a dividend for the company should be more thrown upon him, and for that purpose that more power should be put into his hands. And, gentlemen, if you have got the ablest Court of Assistants in the world (and I know they are very able), and the ablest manager at Cwm Avon, I am quite certain that if the work and responsibility is divided between them they neutralise each other's work, and the concern will not be carried on to a profit. I do, therefore, trust that the Court of Assistants will attach the greatest importance to those recommendations of the Inspectors, that there should be greater power committed to the manager, and I would even go further than that, and say let us have a man whom you can put on the board, and let us go back to the old days. If the recommendations are adopted with regard to that point, then let us throw as much responsibility as we can upon the manager, and give him as much power as will be necessary, so as to enable him to discharge successfully that responsibility. Gentlemen, there are one or two points in the report upon which I had hoped to hear a few explanations, and perhaps we may still do so in this room to-day—points upon which it seems to me there is considerable discrepancy. Mr. Talbot has mentioned what seems to be the discrepancies between the separate reports and the joint report. In one of the reports it is suggested that the manager has been greatly interfered with in the purchase of copper. At p. 42 the joint report says that the manager has not been interfered with. In the report of Mr. May, and also in the report of Mr. Bourne, they speak with great praise of the energy which has been displayed in carrying on the works, but in the joint report they speak of laxity and want of energy. I do hope, gentlemen, that we shall hear some explanation of these apparent discrepancies. I hope we shall hear that the Court, after considering the subject, has decided to act more fully on the opinions of these professional gentlemen, that the manager should have more power placed in his hands; indeed, I should be glad to see him on the board. That he is an able man I have no doubt of, but as long as the management at Cwm Avon is interfered with by the people in London I am convinced that the business will not be carried on to a profit.

Major STEWART: You will remember, Sir, that I have not spoken upon the report, but from the remarks which have been made by Mr. Talbot I am induced to read a few words published by Mr. Gilbertson. I read through his correspondence the other day, and I found this:—"I think I have proved my desire for the fullest audit and investigation," &c. I will pass that. I will now read to you, gentlemen, a letter I received from a shareholder, pointing out what appears to me to me to be a great defect. In common with many others, I may tell you I have been much disappointed at the results of the working of the company, and I cannot but think that there is something radically wrong in the mode of conducting the business. He says:—"Only a fortnight ago I met one of the largest consumers of iron in this part of the kingdom—that is, in the manufacturing district. I asked him if he had ever dealt with our company. He said he had done so several times, but he never went to them when he could go elsewhere, as the process pursued in asking for a quotation of prices was so dilatory that he could never get an answer within fifteen days, and unless he could purchase to an advantage he seldom dealt with the company." This letter is from a gentleman in Birmingham.

The CHAIRMAN: I can authorise you, Major Stewart, to give the flattest contradiction, for such a case has never occurred.

Major STEWART: I should not like to contradict one who states it so positively. I will make a few remarks upon the report which has been presented to us. Mr. Talbot seems to pick out those passages which speak in terms of praise of the Court of Assistants and Mr. Struvé. I may look at it on the other side, and I want to find out what is wrong if possible; at any rate, the conclusion I come to is this, that there are faults on both sides, and I fancy that Mr. Struvé has been too much interfered with. I heard some little time ago that copper ores were bought of a kind which were not suitable for the work, but Mr. Struvé was told to make the best of them. There are other things of that kind, but I will leave them. First of all, one of the circumstances which these directors mention as an excuse is their ignorance of the cost of the production, which is a great disadvantage, whose fault is that? Why, the Court of Assistants, and surely it is the fault of nobody else. If they have not the cost prices sent up sufficiently it is their duty to insist upon having them. For that I condemn the Court. How can you give me the cost of each if there is not an account in existence? The accounts should be as distinct as if the works belonged to other parties. Mr. Phillips says, as to the selection of ores, and that is what I alluded to just now—"As to the selection of ores sufficient discrimination has not been exercised." If so, by whom? I have heard that Mr. Struvé has made complaints. Have you complained of the ores that have been sent to you, Mr. Struvé?

Mr. STRUVE: I am the servant of the Court.

Major STEWART: No, you are the servant of the proprietors. However, if you do not choose to answer the question I shall assume that it is so. "It also appears manifestly unfair to charge the copper works the same price for slack as is paid by other departments for round coal." Whoever heard such a thing as that? I have been at Merthyr Tydvil, and in that direction the slack coal is burnt to get rid of it or to make coal tar, but to charge the same price for slack coal as you do for round coal is absurd. You cannot give the proper costs under those circumstances. Then, Mr. Phillips said, at page 27, "A more cordial co-operation between the London manager and the manager at the works is very desirable, and would result in a regular and better selection of furnace material." Now I say, gentlemen, as I said at the meeting in November, how can works be carried on to a profit when there is a divided authority? Now, gentlemen, I am a tenant farmer, and I am now coming to some little practical matters. Mr. Bourne makes a report, and I find this statement—"At the beginning of the year there were 142 horses employed partly above and partly below ground, costing about 8336*l.* per annum for keep without renewals, which will cost about 700*l.* more." Surely that is a mistake. But when I come to examine the particulars I find that they cost about 1*l.* 2*s.* a week. Now, I am a farmer, and my horses do not cost me more than 11*s.* a week, and I can say that for your carriage horses the cost ought only to be 70*l.* a year for the two. At Cwm Avon it may be difficult to get forage, but then with 142 horses you may employ barges for the purpose, and I would send you down a hundred tons of hay thoroughly compressed, and I would undertake to supply you at the rate of 13*s.* a horse per week, and I should get a profit out of it. At page 41 Mr. Bourne says—"To the foregoing causes of the deficient prosperity of Cwm Avon must be added the want of such a system of accounts as will show the profit or loss in each department." That is the thing I alluded to before. If you have the accounts kept separately you will know the profit or the loss, and you will not have to say that you cannot tell me. Then he says—"The cause of any deficient prosperity must, therefore, be sought in some other circumstances than an undue interference with the manager's arrangements, and we attribute it to a chronic supineness, which has been allowed to grow up in every department." Now, we have heard from Mr. Talbot that Mr. Gilbertson was anything but a superior manager. It appears that he was a solicitor, and perhaps he was not so energetic as a soldier might be. It seems to me that you have allowed people to go to sleep, and perhaps the Court of Assistants have not been so frequently or worked so long at Cwm Avon as to keep the people up to their work. I think, if Mr. Bourne's report is correct, there is fault to be attributed to both there. Then he says—"We would further suggest that the office of secretary should be separated from that of salesman and manager of the store department." Now, who is meant by the manager of the store department? It cannot be anybody else than the secretary. The Court of Assistants, perhaps, have left the work to him, and he has dubbed himself the manager, and has had his salary increased to 500*l.* a year. Surely the secretary cannot be a person to buy ores for the copper works. He cannot be a judge of those if he is a secretary. He is merely a person like a superior clerk to write letters, and so on. He is not a person to be employed in that way, and without knowing anything of the matter. The surmise does arise in my mind that a great deal that we have to complain of is to be put upon the shoulders of the secretary. The Court has left a great deal of it to him, and he has dubbed himself the manager, perhaps because he manages the Court. Then they say this—this is the joint report—"Our unanimous opinion is that by adopting the suggestions contained in our respective and joint reports, coupled with the introduction of energetic management, and the maintenance of harmonious action and cordial co-operation in every department, the company may be very soon rendered fairly profitable." Now, those are three hard sets of words, all levelled, I think, at the Court, because I cannot think that Mr. Struvé, when he merely objected to answering my question just now would set the Court at defiance, and, therefore, it is the Court that they refer to there. I had intended to offer an amendment as regards the report, because I saw there were difficulties in the report. I did not know how they were to be got over. That about the railway Mr. Talbot has explained a little, but the works are not reported to be in that state of repair that they ought to be, and I fancy that a considerable sum of money will be required to put the works in a proper state, and where is it to come from? I had intended to offer a suggestion that a committee of three gentlemen should be appointed to consult with the Court for the purpose of ascertaining if money was required, and if so, how it was to be got. That is not a matter which we can attend to in a public meeting. We are all talking upon different matters. I spoke upon one matter, Mr. Talbot spoke upon another matter, and I have now addressed myself to another.

The CHAIRMAN: Gentlemen, it is always better that we should not proceed upon any erroneous ideas, but the argument of Major Stewart seems to be founded upon the supposition that the Court has approved and endorsed all the recommendations of these reports. They are the reports of the professional gentlemen, and the Court have expressed no opinion at all upon the several details; therefore, until they are proceeding to carry it out I think it is a little premature to discuss it.

Major STEWART: I think not. The report being before you, you will have to consider it, and surely if you were to have some of the members of the proprietary to talk the matter over with you, you would come to a conclusion which would give satisfaction. I do not know that there is any question before the Court at the present time.

The CHAIRMAN: Yes, the question is the adoption of the report, to which, after what you have said, I presume that you will move an amendment.

Major STEWART: There are two other amendments which I propose to move.

The CHAIRMAN: If they do not bear upon the subject of the report it will be well to reserve them.

Major STEWART: They bear more or less upon the affairs of the company.

The CHAIRMAN: This does not preclude the proprietors from bringing any resolution forward after they have adopted the report.

Major STEWART: Very well, then.

Mr. BYASS: Sir, I would desire to make a remark or two. It would appear from the report that the Cwm Avon Works are in a position to compete with any other works of a similar character, both in cost of labour and material, and in every other particular. It would also appear that the produce of the works is good, for we have never heard any complaint made in reference to the production of these works—particularly the tin-plate works. With reference to the others I am not able to speak so positively as I am with reference to tin, but I am quite satisfied that there are two or three points that are materially affecting the prosperity of the company. One is the purchase of the article which you are called upon to manufacture. The next is, and much more important, the sale of the article. Now, if the management had been left with the manager, and there had not been an undue interference on the part of the board, I am sure that instead of having a debit to the tin-plate works you ought to have seen a profit. I speak practically upon that point, because I am not very far distant from the works, and my impression is that the whole and sole cause of the non-prosperity of the works may be found entirely in the interference of the board of directors. (Hear, hear.) I am perfectly satisfied with that, and I will call the attention of the meeting to the undue interference emanating from the manager, as he is called, in London. You employ a man who cannot be supposed to be in the slightest degree acquainted with the ores, who purchases them whether the manager at Cwm Avon likes it or not. I believe if an expression does come from the Chairman it will be one of great discontent on his part with what has taken place; and I should like to know very much, and perhaps the Chairman will tell me, whether the whole of the correspondence, or at least a great part of the correspondence, passing between the manager in London and the manager at Cwm Avon is endorsed by the directors in London; or whether it is the act of the manager in London alone, without the sanction of the Court of Assistants? I can scarcely conceive, from all that I have heard, that such can be the fact, considering the interference on the part of the manager. My own opinion is that if practically carried out by practical men this concern ought to be paying a dividend, and a very handsome dividend; but I am perfectly satisfied, from the remarks which have been made with reference to the interference of the manager in London and the board of directors, that there should be more responsibility placed on the manager at Cwm Avon, for I am quite satisfied that is the sole reason that we are not receiving a dividend. Therefore, I should suggest that there should be a committee formed, for the purpose of taking into consideration the importance of greater co-operation with the manager at Cwm Avon. My opinion bears out entirely the reports and the remarks made by many of the gentlemen here. If you are making your goods at 10 or 15 per cent. greater cost than other manufacturers that will not do, but your reports say that you are upon a par with any other other manufacturers in this part of the country. I think that is the most important point—that the investigation which has taken place by practical men proves that we are in such a situation that we ought to produce as good an article and upon the same terms as any other manufacturer.

Major STEWART: The amendment was suggested to me to move for a committee to be appointed.

The CHAIRMAN: It is as an amendment to the adoption of the report; that will be the better form to put it into.

Mr. BYASS: We have met here to consider very important questions, and I think, judging by the sentiments expressed by our worthy Chairman in our proceedings to-day, the Court of Assistants have every desire to look at the question as it ought to be looked at. I cannot think that there would be any difficulty whatever in acting in co-operation with some of the shareholders—indeed, I think the directors might be glad to do so, and, therefore, having rendered attention to the report made by the gentlemen appointed on Jan. 2 last, I would propose that the following gentlemen be appointed a committee to consider the report of the inspectors, and also the question of the management of the company, and to report to us at an adjourned meeting, to be held on Sept. 1. That is the proposition I should propose, that the committee consist of the following proprietors—Mr. Beattie, Mr. Crewdson, Mr. George Benson, Mr. Edgar Stringer, my name is put down, Mr. James Robertson, and Mr. William Whatman—that they be appointed a committee to consider the report of the inspectors, and the question of the management of the company, and to report to us at an adjourned meeting, to be held on Sept. 1.

Mr. BENSON: Mr. Chairman and Gentlemen, as one of those appointed a member of the committee of consultation at the meeting which was held, it seems that I am expected to speak to-day. I do so with great diffidence, because I am not much accustomed to public speaking, but I may say this much, that the whole course of the investigation showed to me (I am speaking for myself now) that it was impossible for the concern to go on as it was going on. (Hear, hear.) And why? I think the expenses ought to be reduced, especially in London. I give the Court of Assistants credit for being a board of great ability, and they have no doubt great ability, but I think any of you gentlemen who understand the nature of business can hardly expect the Court of Assistants, composed many of them of gentlemen engaged in other businesses, to give that undivided attention to a concern of this great magnitude which would fit them successfully to carry it on; and, therefore, it seemed to me to be essential that, whatever else was done, there should be some head man appointed, i will not say with despotic authority, but with great authority, to carry out these works, and that the business of the Court in London should be much more one of supervision than executory. (Hear, hear.) There is another thing, gentlemen, which suggests itself to my mind, and that is whether it would not be well—and if I am not mistaken it is alluded to in one of the reports,—although I do not wish to point out any particular individual, or to say whether Mr. Struvé may be the best person for the purpose—that is not the point,—but the question is, whether it would not be well to have a person as a sort of managing director? It has struck me also whether a person of that sort ought not to have some further interest than that of a mere salary, and whether he should not in part be dependent upon results. I think it would be well to consider whether the remuneration should not be made to depend to some extent upon the results, and whether that which is paid to all, in fact, who are connected with the management should not also depend upon the same thing. For, gentlemen, it does seem hard upon the unfortunate shareholders that they should get such a little dividend, and that the directors should get the remuneration. I think that if something of that sort was carried out we should get on, and I am glad to find that the proprietors themselves are of that opinion. We want to be brought back, to some extent at least, to what we were in Mr. Gilbertson's time. We have been talking about managers and directors and other subjects, but I do think that the shareholders have been much to blame. They have allowed this to go on year after year, and it is not until now that they have really exerted themselves, and, therefore, let us take some blame to ourselves. I beg leave to second this proposition. I would rather that my name was not on, if you would kindly appoint somebody else.

Mr. HAWES: I must entirely dissent from the proposition of the appointment of a committee. We have before us the reports of the four gentlemen appointed by the Court of Assistants, who have gone most elaborately into every enquiry that it was necessary to investigate to enable them to form an opinion upon the subject. Gentlemen, it is very true that Mr. Talbot has selected a series of passages throughout those reports to show how much they praise the present management at the works; but, on the other hand, I must say that it is just as easy to select passages to show the reverse as to the management—in fact, I think the expressions of disapproval are much more strong than those of praise. For, gentlemen, what can possibly be stronger, looking at it from a business point of view, than this:—"The letter of instructions given by the Court to the manager on his appointment, and the general tenour of the correspondence which has since taken place, show that the Court have invested him with the full powers necessary to carry on the operations of the works in the most effective manner. The cause of any deficient prosperity must, therefore, be sought in some other circumstances than an undue interference with the manager's arrangements, and we attribute it to a chronic supineness which has been allowed to grow up in every department, and which it will require vigorous and energetic measures to undo."

Mr. TALBOT: I quoted that.

Mr. HAWES: I know you did, but you quoted it for another purpose. The gentleman, therefore, who manages your property has been acting, according to these gentlemen's report, with ample authority and independence. Then it is suggested that the accounts ought to be kept in another form, or shape, and that that has been the cause of the failures for the last nine years; but if we agree in nothing else, gentlemen, I think we must all agree in this—that whether we keep the accounts in one form or another, the accounts do not make profit. They will enable you to determine what is attributable to each department, but they do not enable you to make the ultimate balance; and unless you have some man at your head who undertakes personally, not the management of one individual department in which he may be engaged, but who has the talent of combination and co-operation with others, and constructive knowledge—unless you have that kind of man you cannot make these works succeed. We want a man at the head of each department, and we want a man above them all, to direct, control, and govern; therefore, unless the directors lead us to suppose that they will so consider the report as to make such changes as will lead to a complete re-organisation of the system I should not be content to leave them wholly unfettered, because the directors tell us now, and we have been told several times to-day, that they have done nothing, and they tell us that in most emphatic language—they say "The Court having now been enabled to ascertain many causes of the evils which have so long oppressed the company, will next proceed to take measures for their effectual extirpation." Then, gentlemen, what can be stronger language than this—"What those measures will be they are not at the present moment prepared to explain—beyond this, that they will be based upon the professional reports now presented, which appear to the Court to afford the key to the future policy of the company, and which they will consider it to be their duty to execute and develope to a successful result." Now, gentlemen, what in the name of fortune can be the use of appointing five or six other gentlemen to enquire and make an examination of the affairs and accounts of the company, they having, of course, far less information than your directors must have? A proposition to appoint such a committee as that is merely throwing dust in our eyes; it is merely asking further delay, and will not produce you a shilling of profit. But if the Court of Assistants conscientiously, and as men of business, having these reports before them, will look into the matter, as I am sure they will do if we give them a sufficient amount of time for the purpose, then they will be enabled to say what they propose. We have two or three members of the Court who have laboured earnestly in the interest of the company for many years, and after they have considered the matter if they cannot say what they are prepared to do, then let us take the thing into our own hands, and remove them, and manage it ourselves, or else wind-up the concern altogether. But, gentlemen, I look forward to a state of things when trade will be better, when the coal trade will be prosperous, when the copper trade will revive, for I believe the copper trade cannot be worse than it has been, and if you take those two great ingredients, which I think you may safely rely upon, and if the directors will carry out the recommendations of the report, then I think we shall be brought into a more solid condition. Now, gentlemen, a great deal has been said about the London expenditure. It is said that it is 4000*l.* a year. But, gentlemen, are we not to have directors, and if we do have directors, where are they to be? If they are to be in the country, away from you altogether, at a place where you will not be able to gain access to them, would you be inclined to repose confidence in them—would you have any control over them? Any new men whom you might appoint to consider the subject would have to acquire all the information which the Court of Assistants now possess, and that is not a thing very easily done. My friend at the end of the room complained just now of the amount of remuneration. I confess I did feel, with some other proprietors in this company, that the amount of remuneration of the directors ought to be reduced, and I did regret that it was not reduced to 1000*l.*; but, gentlemen, nothing can be worse than to reduce directors' salaries or servants' salaries to such an extent that it will practically prevent them having any interest whatever, pecuniary or otherwise, in the concern. If you want your officers in the country to work, and do the best they can for you, pay them good salaries. If you want officers in London pay them well, and if you like give your manager a certain sum in proportion to the profit; but it is lamentable for the sake of 400*l.* or 500*l.*, when we have several hundreds of thousands of pounds invested as capital at this moment, to suppose that the mere reducing of the remuneration of the directors at such a time will be otherwise than injurious. Gentlemen, I do hope that they will be prepared to consider fairly, and adopt the report, and that in the fair spirit of the words they use the directors are about to follow up the suggestions of the professional gentlemen who have been consulted on the subject, so that in the course of a little while we shall again meet together, and have placed before us a very different result.

Mr. LAYE: Mr. Chairman, I represent fatherless children, and I have 5000*l.* invested in this company. We have waited nine years, and you all know the result. We have tried the gentlemen who have had the management of this company, they have failed, and I say therefore, that we had better have fresh ones—let us have somebody else.

A PROPRIETOR: Who would you have?

Mr. LAYE: That must be for future consideration, but I say that in everything the Court of Assistants have done they have proved themselves incapable. Surely a concern of this sort is to be made profitable, and I think it is time we had a change. They have said year after year we cannot make a profit. If that is so let us have a change, let us try somebody else—it is no use moving amendments and making suggestions, and all that kind of rubbish, we want to have the thing worked in a proper manner, and these men have given us nothing at all during nine years, and what further proof does anybody require? I should say there should be a re-constitution of the company, so that some of these old charters and things of that sort are got rid of—let us have a re-constitution, and let us make it a limited company, and let the thing be carried on by a manager.

Major STEWART: You must have a board.

Mr. LAYE: I propose to move that this meeting has no confidence in the directors.

Mr. HORNBY: Mr. Chairman, my opinion was before I came here that we came to consider the report given to us of four gentlemen sent down to Cwm Avon to enquire into and inspect the works and the management, and I was in hopes that the Governor would have expressed his opinion and those of his colleagues as regards the substantial parts of the report, and that they would point out to the meeting those parts which they consider worthy of regard, and that they would have stated whether they intended to carry them out or not. I expected also that they would have told us why such and such an one would not be correct, and have given explanations why and wherefore. Gentlemen, I am one of those who could not support the appointment of any further committees, neither shall I support the proposition that has been made upon my right hand, because permit me to say I have some knowledge of the gentlemen who sit at the board, and I know that they have been very active and very anxious indeed to promote the interest of the Cwm Avon Works. The results, of course, have not been favour-

able, but I am told that the iron trade, copper trade, and the tin trade are all very bad. Gentlemen, it is well known at the board that I always expressed an opinion that we ought to know whether we are working at a loss or at a profit, and that we have no right to wait until the end of the year or the end of six months to know whether we have made a loss or a profit. I think the board will bear me out that was always my opinion when I had the pleasure of sitting with them. I am of opinion that it is most important that there should be a responsible and a substantial direction over the whole works, that the manager should be well supported with sub-managers, but that he should have full control over them, and that any misdoings of theirs should be reported by him to the board without any undue kindness or affection upon his part. He has to manage a very large and important business, and he ought to have an able head, strong mind, and great determination. I have expressed an opinion more than once that friendship did not exist between the officers in London and the manager at Cwm Avon. I have not expressed that opinion before, except to members of the board, but the time has now arrived when I do say I agree with a great many of the remarks that have passed to day—that there is too much interference on the part of the secretary with the manager at Cwm Avon. I think the secretary ought to attend to his secretary's duties, and that the manager at Cwm Avon ought to be under the control of the Court only.

Mr. LAYE: Yes, we want a change.

Mr. HORNBY: I will not argue that point with you, but I say distinctly that the management at Cwm Avon could not be in more able hands; but, at the same time, I think there ought to be direct management at the works, without any interference on the part of any of the officers in London. Having said that much, I have done with that subject. Then, gentlemen, with regard to the expenses at Cwm Avon. I think they are excessive—I mean in what are paid to the clerks, and the expenses of the management generally. I may say when I first went down to Cwm Avon the first thing which struck me was the fearful expense of horses. Mr. Struvé has somewhat reduced that by railways, but when I look at the list of last year I find that they have gained a little, because there was then 444l. paid in salaries, not including the head manager, Mr. Struvé. This year it is 408l., but when you come to look at the duties of these persons I think this sum is extremely excessive. There are pay-clerks for the works—half-a-dozen of them—and they come to 647l. I should say myself that if I were carrying on those works privately I should not have half-a-dozen pay-clerks at such a place as that. One clerk is at one place, and another clerk at another part of the works. I think they ought to be concentrated. Then you have the length of service, and with reference to that subject I may say I am not one of those who would discharge an old servant, but I would put him elsewhere—I would pension him if need be, if I thought he was not sufficient for his position. Now, the manager of the tin works has been 43 years in the service. I do not suppose he can have begun before he was 15, and that brings him to a very old man, and I should think he cannot be up to the present great moves. Another man has been 48 years in the service, and so on. I repeat that I should be inclined to give them a pension, by putting them in a place of less responsibility; but I think the foreman of the tin-plates works should be youthful and energetic, having the experience of the present day. Then, I think that the office expenses in London are exceedingly heavy; they come to 1700l., which is merely the pay of the clerks. I think there is plenty of room for large reductions there. Then there are reductions which are mentioned in the report. As I said at the commencement so I say now, if the Governor and his colleagues would have told us at the commencement that they had inspected the report, and had given us a clear opinion as to how far they intended to act upon it, then I think we should have saved a great deal of time, and it would have been more satisfactory. With regard to the probability of the works paying a dividend, I think it can be obtained if they are put under proper management, and if the manager is made responsible for his position.

The CHAIRMAN: Gentlemen, In putting the amendment, I think it unnecessary now to do more than make one or two general remarks. With regard to one point, I will dispose of my friend, Major Stewart at once. He said that the Court had left the secretary to do as he pleased, and that he had dubbed himself the manager. Now, so far from that being the case, he was appointed the London manager several years since by a resolution of the Court in Mr. Haslewood's time. With regard to the duties which the Court performs, I may mention that the Court or the committee meet four times in the week. There are other points which, after the clear and lucid observations of Mr. Hawes, and of other proprietors, no longer require a reply; therefore, I will limit myself to the point of the management. Now, gentlemen, I have paid great attention to the remarks which have been made to-day, as, indeed, is due to them, I am not about to examine or analyse their accuracy or value. Many of them are subjects which belong essentially to the Court of Assistants, upon whom devolves the responsibility, rather than upon the proprietors, who are irresponsible for the results. The question is now narrowed to a very small compass. I should mention that the reason for not giving the views of the Court to-day on the report is that it was only received a few days before it was issued to the proprietors, and the Court have, therefore, not yet been able to give sufficient attention to it to state the precise course of action they propose to adopt. With regard to the amendment which has been moved, it appears that several gentlemen think that there should be increased powers given to Mr. Struvé, by, in point of fact, making him managing director, and it has been suggested that his personal attendance on the Court, with adequate powers vested on him, will be alone necessary—that a panacea would thereby be found for all existing evils, and an annual deficit converted into a continuous surplus. It may be so, and I wish it were. The points on which these gentlemen appear to rely in support of their views are that the manager has been unduly and unceasingly interfered with, that he has not been allowed free and unfettered action, but that he has been hampered by the Court, whereas he has always been acting vigilantly and economically. Now, gentlemen, we (the Court) entertain a totally different view, and there are many facts and circumstances which, if rightly understood, would probably have led to a very different conclusion to that entertained by some of the proprietors. It is, however, as I have already stated, a question rather for the Court than the proprietors, and it appears to me that it should be left in the hands of the Court, holding the Court responsible for any shortcoming, and by that means have the responsibility thrown, and the blame, if there is any, upon the persons who ought to bear it. I have no hesitation in stating that Mr. Struvé has been invariably allowed the fullest and freest action by the Court in all respects, and what has been the result? He has never been in any way hampered. Mr. Frewer's correspondence with Mr. Struvé and Mr. Struvé's correspondence with him may have both been a little hasty, and some of the letters had better not have been written; but, giving them both credit for being solely influenced by their anxiety for the interests of the company, the Court have said less about it than they would otherwise probably have done. I repeat most distinctly that Mr. Struvé has not only never been interfered with, but that he has not been sufficiently interfered with for the benefit of the company. Now, with reference to the sales. They are stated in the reports to have been well made. I have taken great trouble to ascertain it, and I have found that those sales have been generally at or above the market price, and that in this respect the company have certainly no reason to be dissatisfied. With reference to the cost of production, when the Court have applied for the cost-sheets to be sent up they have been told that they cannot be spared, although that is the most frivolous plea which could be put forward. They ought to be prepared on sheets, and then entered in the books, and the sheets sent up to the Court, who cannot obtain them, but who are furnished periodically with abstracts of them, which have in many cases been found to be incorrect and entirely unreliable for any useful or practical purpose. Different statements have been subsequently sent up. They have been constantly in excess of the current market rates, and if we cannot produce our goods at a lower rate to meet the markets, I tell you at once most emphatically that you have not a hope of ever recovering your ground. It is the key to the whole problem. Then, a plea has been put forward about the ores, and a more frivolous plea was never alleged. Mr. Struvé is always informed, at the same time as the Court, of all the ores that are put up for sale at the Ticketings; he knows the fullest particulars from the assays as to quantity and yield; he knows what quantity he has on hand, and what he requires; and he has only to give directions, which would be implicitly attended to. There are occasional valuable cargoes which come in from time to time and are purchased, and one of these cargoes of Bolivian copper had not so large a percentage as usual in it. These details bear upon the questions which you have been discussing, and, therefore, I am obliged to refer to them. Mr. Frewer at once claimed and obtained the proper allowance for the difference. Mr. Struvé has had the fullest opportunity of judging of these matters, and, therefore, it is not correct to say that the cause of the present state of things arises in any degree from any interference with him at the works; but the real cause is the cost of production, which is excessive. I make the statement advisedly, and you may assume it as a fact. In 1866 I saw how your affairs were proceeding—how they were drifting into complete destruction—and I wrote the strongest possible letter to the Court of Assistants. I told them then that they must have an examination of the whole matter, and, if any proprietor would like to see the letter I then wrote it can be seen at the offices. The sole object of the Court being to get the company out of its difficulties, they at once recognised the policy of such an investigation as was suggested, and has since been so effectually carried out; but the Court were on this, as they had been on all other occasions, so desirous that nothing should be done without consulting the manager at the works, that they requested him to attend the Court, and laid the letter before him for his views and opinion. Mr. Struvé said it was unnecessary and practically impossible, that he could and did attend to all the needful changes and improvements, and intimated that it was an impeachment of his capability and management, which was not warranted, and an interference on my part on personal grounds towards him. The Court, on hearing Mr. Struvé's strong objections to any such enquiry or interference, took no immediate steps in the matter, as they felt that, under the circumstances, it would be unavailing. I need scarcely assure you, gentlemen, that only one object ever influenced me; but that is the reason why these enquiries have been unavoidably deferred, and the benefits of them lost to the company for more than four years. Another question raised is why Mr. Struvé should not be placed on the board as a sort of managing director. The Court and committees have asked Mr. Struvé frequently to attend the board. I should be sorry to say that his visits are completely useless; but the committee never could obtain any definite answers or information from him. To most of the enquiries for such information he has requested the Court to put it in writing, and send it down to the works. Now, gentleman, what is the use of having such a man as that on the board? I have most reluctantly referred to these matters, and only do so because I believe it is due to you when upon erroneous impressions a course of action is proposed which I know to be completely at variance with the true interests of the company; and if this amendment is carried the Court will regard it as a want of confidence, and act accordingly. I will, therefore, again read the amendment.

Mr. BEATTIE: Sir, I cannot help hoping that you will accept the suggestion made, instead of forcing this to a division. It struck me we were only suggesting that the Court should state whether they are prepared to adopt the views and the policy generally alluded to by those supporting the amendment, and if the Court says they are willing to entertain these questions, I should suggest, for myself, that the amendment be withdrawn, and I would do all I could do with any friends of mine for that purpose, and then let us meet again on a day to be named hereafter. We have our opinions upon the point, and we desire to press them upon the Court, I hope in a very respectful manner, for I do not want to give any offence; and, therefore, I was in hopes that you would accept the suggestion, that you would have gone into the various questions suggested by these reports, and that then we could receive from you the results of your deliberations. If the suggestions made on this side of the table were accepted, well and good. I think myself that the most essential thing is the suggestion made as to charging Mr. Struvé with greater responsibility, and, in fact, carrying out the recommendation. But if I understand the remarks which you, Sir, have made, you are in direct opposition to that recommendation.

The CHAIRMAN: Not at all.

Mr. BEATTIE: If you are I shall support the amendment; but if, on the other hand, you are disposed to ask time to consider what you will do, then I will endeavour to induce my friends, as far as in me lies, to withdraw the amendment, and allow you time for the purpose of consideration.

Mr. BOND: Mr. Chairman and Gentlemen, as an attack has been made upon one gentleman, Mr. Frewer, an attack which I venture to say will simply astonish the whole of the metal market throughout London, I am perfectly sure that you will permit me to say that from my knowledge of him he has had the management of a very arduous task; he has paid considerable attention to it, and there is not a more energetic man to be found in the whole market than Mr. Frewer. I am so astounded by what has been said, and feeling so strongly as I do that his services are most valuable——

The CHAIRMAN: No doubt about it.

Mr. BOND: That I could not allow gentlemen here to go upon such an erroneous assumption as for one moment to believe that the manager at the copper works down in Wales was making the profit while it was being lost in London. Now, everybody who is in the trade knows that the copper works do not buy their stuff in Wales; they buy in London. The particular lot of ore which has been referred to I am acquainted with, and it was a parcel of Bolivian ore bought to arrive. When it came over it was found it was not up to the mark. Those from whom it was bought said we do not want to take any advantage of you; refer the matter to a broker and a smelter; and they said they did not think an allowance ought to be made, but at the same time they said if they wished to be liberal they should make an allowance, and an allowance was made accordingly. All people who deal with Mr. Frewer will everyone of them say that he buys well, that he sells well; and I may tell you that last year he bought the cheapest parcel of tin that was bought, he sold the dearest copper that was sold in the market. The works at Cwm Avon are well known; its productions fetch a better price because the brands are so much liked; and, with reference to another observation which was made, the universal experience of everybody is that he gives the most courteous attention to everybody who may ask of him prices, or with whom he may deal. I certainly should have preferred that somebody else had spoken, but as such observations had been made, and as I was able to speak to the real facts of the case, I could not restrain my expression of astonishment at the remarks made by some gentlemen as to what is done by Mr. Frewer, when they really have not the means of knowledge which others have.

Mr. JOHN HARMAN: Gentlemen, with regard to all that has been said as to alleged supineness, and in regard also to the remarks which have been made, allow me to say that I have known Mr. Frewer for a good many years, that I have paid considerable attention to the working of the concern, and have had a great deal of opportunity of knowing the value of Mr. Frewer's services, and I can most cordially and distinctly endorse all that the last speaker has said. I think if any charge is to be made on any officer of the company, it most certainly should not be in that direction. I have very great cause to thank him for his services, because I know that any forgetfulness which there may be at the moment is immediately caught sight of by our much honored secretary, and I have the greatest pleasure in speaking most highly, for I cannot speak too highly in his favour. Gentlemen, some time ago it was alleged that the sales were made at a disadvantage to the company, and that much better prices might be got. As one of the directors it was my duty to enquire into the fact, and I then challenged those who brought forward that allegation to substantiate it, and to give the figures relating to the whole series of transactions as to which it was said that the sales might have been made better than we had done. I had no answer to my request, and the whole thing fell through, showing very clearly indeed that those allegations had no foundation whatever. I do not mean to occupy the attention of the Court any more except on one point, and that is to confirm what has been said by the Governor with regard to the confidence reposed by the Court in Mr. Struvé. I distinctly state that during the whole time he has been the manager he has had full power, and I call upon him if he can deny it. He is not a shareholder at the present moment, but I ask him to say whether he has been thwarted in any way by the Court in any matter in which he ought not to have been thwarted?

Mr. BRAITHWAITE: As you have descended into personal remarks on the subject allow me to say this, that the mover of the amendment did not make any charge on the secretary or on the manager, but I understood him to move a resolution, the object of which was to elicit the intention of the Court as regards the future. I think it would be satisfactory if the Court would agree to an adjournment of the meeting, and then submit their views to the proprietors on a future occasion. I believe we are all equally convinced that they are gentlemen who would on all occasions act to the best of their ability, but a committee of investigation was appointed, and the gentlemen to whom you referred the whole question of the carrying out of the works all agree in this, that the throwing of the responsibility upon the manager, with the supervision of the Court here, is essential.

Major STEWART: I would ask you, Sir Macdonald, whether you could not act in conformity with the reports, and at the same time carry out any views you may have without interfering with your powers?

Mr. TALBOT: I should like to ask the Governor one question, because it will materially influence my vote, and my question is this—Whether the Court is prepared to adopt the suggestions of those gentlemen made in the joint report? and that is, that the office of secretary should be separate from that of salesman and manager of the store department.

The CHAIRMAN: It is premature for the Court to say what they intend to do. As I have already said before, dealing with these reports it will require some little time to give due consideration to them; but Mr. Talbot's question is one which I think I may answer at once—that is a suggestion which there is very little doubt we shall carry out. I have already told you the views which the Court entertain with reference to the amendment to the report, which I shall now put to the meeting.

Mr. BENSON: Before that is done, Sir, I wish it to be distinctly understood that I did not make my observations with any view to an opposition to the Court. I thought I guarded myself against being supposed that such was the case by stating that I considered the Court were gentlemen in whom we should place very great confidence. As a body, I do not think you would get anything superior to it, and so careful was I that that should be perfectly understood that I purposely abstained from reading that part of the report as to the want of energy or industry, in case it should be thought that I was alluding to the Court, because, gentlemen, we are all responsible for the acts of our servants, and if the concern is carried on with a want of energy we ought to bear our share of the blame. Therefore, I should be sorry if anything I had said should be productive of any uncomfortable feeling. If the Court had been prepared with a definite plan to produce to us to-day I should have been the last person to propose anything; it was only when we came here, and we found they had nothing to state as to the future course to be taken, that I said anything. Therefore, if the meeting will leave it in the hands of the Court until they have matured their plans, which they then can report to a meeting to be held for that purpose, I shall be content, and we shall then know what they intend to do.

Mr. BYASS: I will withdraw the amendment, under the full impression that the sentiments of the Chairman will be carried out, and then he may adjourn this meeting, and then report to us as to the future management of this concern, leaving them quite unfettered, and simply adjourn the meeting.

The CHAIRMAN: Of course, if you adjourn this meeting you tie our hands—the matter stands still. We have no right to complain of that, but either you have confidence in your Court or you have not. If you have, when they tell you that they will consider these recommendations as far as they can, and consult your interests with regard to them, surely that is enough; but if you like to tie up their hands, and prevent anything being done in the meanwhile, that is another question, and then you can, of course, adjourn to any day which you like to fix.

Mr. BYASS: I cannot conceive that it will tie up your hands. If you like to consult practical men well and good, but we all know that there are in the room a good many who could help you, and it was upon the ground that I believed there are many gentlemen who can assist you that I proposed what I did. Nobody imputes anything that is not perfectly consistent with fair dealing, but I do mean to say that in this room there are a great many men who have had the opportunity of getting information which might be brought to bear, and who could exercise considerable intelligence, and I, therefore, acted upon that impression; but I am quite willing to withdraw if you will appoint any day when you will state your views upon the report of the reporters. The Court says that they have not had time to consider the report; if they had we should no donbt have heard from them some definite opinion as to the course they would pursue. But let us give them the opportunity of forming an opinion, and let us adjourn the meeting is the proposition.

The CHAIRMAN: Then you still suggest that the meeting be adjourned for the Court to report?

The CHAIRMAN: Gentlemen, had the Court professed to say what they intended to do upon the hasty consideration which they must necessarily have given to this report, I think you would have said that it could only be a very partial, superficial, and imperfect view; but if you leave it to the Court to call you together again at the earliest convenient date I think that would meet all views.——Mr. BRAITHWAITE: Yes, that would be better; let us leave it to the Court.

Mr. BEATTIE: Sir, all we ask you is that you would tell us what you intend to do upon the recommendations contained in the report, and I hope that you will accept them. We do not wish to press you to state at once your view; you have not had time to make up your minds, therefore I should suggest that you have time to do it.

Mr. LAYE: During that time are you to carry your recommendations into effect or not, or are they to be approved by the meeting, who can only have partial information? No time can be spared.

Mr. BYASS: I should like to ask Mr. Struvé what he has to say with reference to the observations that have been made.

Mr. HAWES: You can do that presently. I shall have another resolution to move.

The CHAIRMAN: Then the meeting is to be adjourned to a date to be fixed as early as convenient, to communicate the course the Court propose to adopt.

[The original resolution was then put to the meeting and carried, with two dissentients.]

Mr. HAWES: The resolution which I propose will give Mr. Struvé an opportunity of speaking. I wish to convey a clear and definite direction to the directors, as the opinion of the meeting, as to the main source of our difficulties. The resolution which I propose for the adoption of the Court is this:—"That this meeting, after a careful consideration of the reports of Mr. Smith, Mr. May, Mr. Phillips, Mr. Bourne, and the recommendations in their joint report, and having also considered the reports of the Court in November, 1869, and that now read, in which it is stated that the Court will proceed to take measures to extirpate the evils which have so long oppressed the company, desires to express to the Court of Assistants its conviction that nothing but the most decisive, energetic, and immediate action at this crisis of the company's affairs will save it from absolute ruin; and that in accordance with the recommendations of the professional reporters, and those contained in the reports of the Court of Assistants, it is indispensable—1. That a new general manager, competent to reorganise the mining and manufacturing establishments of the company, and substantially to carry out the recommendations of the reports submitted to this meeting, be appointed without delay.—2. That sub-managers, thoroughly acquainted with each department of the company's works and manufactures, be also appointed.—3. That if a manager or sub-manager competent to undertake the duties required from them cannot be found among persons now employed by the company, immediate steps be taken, by advertisement or otherwise, to obtain the required assistance."

The CHAIRMAN: I think before that is seconded I might suggest that it is rather anticipating what may hereafter take place. It is very probable that a portion of it may be adopted. It is evidently prepared with very great ability and care, and the proprietors must feel indebted to Mr. Hawes for the trouble he has taken in framing it; but if he will defer it to the adjourned meeting I think it would be more regular and convenient.

Mr. BRAITHWAITE: Yes; defer it to the adjourned meeting, but I do think that Mr. Byass is quite right in asking that Mr. Struvé should be asked to explain anything that has been said.

Mr. STRUVE: Mr. Chairman and gentlemen, I understand it has been suggested that the directors have interfered with me as the manager of the Cwm Avon Works. I have not complained that they had done so, and I am not aware that I have ever said it; but it does interfere with the management that I have nothing to do with the sales of the produce. I think one of the great things to be complained of at Cwm Avon is this, that the departments have not been kept well filled with work; the falling off in our sales has been considerable. Last year our tin-plate department was only making 1000 boxes a week, when all the other works in the neighbourhood were full of work. At the end of the year we had on hand 23,000 boxes of tin-plates. If all of them had been sold at the large price which could have been obtained for them, I say at once it would have extinguished the loss. If we had only made the same quantity of tin that we had made the previous years, we should have made a profit. That is what I complain of. How can there be energy and industry if we are kept partially idle? We have upwards of 6000 people there, and do you suppose that you can have those people kept idle, and we work with energy? In that respect I am interfered with. I have nothing to do with the purchase of the ores. I cannot even write to our agent without communicating. The Court will not deny that. About the letter which the Chairman says was written, I think it would be fair to read the proposal of the present Governor for a practical investigation. It was proposed by Sir Macdonald Stephenson. It was discussed by the Court, and the Court dismissed it. I had nothing to do with it.—[Read a portion of the Governor's letter.]—What in the world can the pressure have on the result? Gentlemen knew nothing of this, except they were told about it, and not a soul at Cwm Avon knew a word about the letter. I say the works at Cwm Avon never can do justice to the manager, or to anybody else, unless he is informed of the purchases and sales. They form a large element in the cost. Our sales have fallen down wonderfully. We used to make 491,0 0l. by gross sales, but they have gone down to 365,000l. If the sales had been up to the mark, the works would have paid.

Mr. HAWES: Was there a profit in those years?

The CHAIRMAN: I may explain that the reason of what you are referring to was that the Court found you could not make the plates except at too high a rate, and much above the market prices, and that until you could produce them at a less rate it was much better to do less work and incur less loss.

Mr. STRUVE: If we could work in the same manner as our competitors do we should make a profit. As regards the cost-sheets, I do send the cost-sheets as quickly as they can be made out—every quarter. They ask for the costs oftener; it is impossible to do it. The absolute cost of the result of the proceeding you cannot determine; every day in the week you must take the cost for a longer period than that before you can properly represent the proper profit and loss account; it would be impossible to do it every week. If that were to be done we should have to completely pay every week, and to take stock every week. As for stating that I have sent reports which are not correct, all I can say is I have not done so; but I do state this, that Mr. Frewer has sent all sorts of troublesome questions for me to answer, particularly when he has been slack of work in London.

The CHAIRMAN: We will not continue the discussion further.

Mr. HARMAN: I have great pleasure in proposing that Sir Rowland Macdonald Stephenson be re-elected Governor of the company.

Mr. NEEDHAM: I beg to second that.

The resolution was then put to the meeting, and carried with one dissentient.

The CHAIRMAN: I have to propose the re-election of Mr. George Turnbull, with whom I have worked for 20 to 30 years, and can attest that he is a most assiduous and valuable member of the Court.

Mr. BEATTIE: Allow me to second that. Knowing Mr. Turnbull's practical knowledge I have great pleasure in doing so.

The resolution was then put to the meeting, and carried unanimously.

Mr. FREEMAN proposed the re-election of the auditors, Mr. Beattie and Mr. Stringer, and said that their names were too well known to require any recommendation from him.——Mr. BRAITHWAITE: I second that.

The resolution was then put to the meeting, and carried unanimously.

Mr. HAWES: Mr. Chairman, before we adjourn we must thank your for your attendance here to-day; you have had an arduous matter to attend to.

Mr. BRAITHWAITE: I have great pleasure in seconding that.

Mr. HAWES then put the resolution to the meeting, which was carried unanimously.

[For remainder of Meetings see to-day's Journal.]

The Royal School of Mines, Jermyn Street.

MR. WARINGTON SMYTH'S LECTURES.

[FROM NOTES BY OUR OWN REPORTER.]

LECTURE XLV.—Having mentioned the circumstances under which windlasses are employed to a large extent, I may add a few facts as to the efficiency of their work. Indeed, there are places in the South of Europe and South America where water power is out of the question, and, indeed, where water is so entirely absent that enough could not be obtained to supply the boilers for steam power, or even for horses to drink if they were employed. The theory of the windlass is one of the simplest of all mechanical contrivances, and all that is required is so to arrange as to find, if possible, an equilibrium for a certain amount of the dead weight. The use of the windlass being thus highly important, it is useful to know what amount of work can be done per man, working honestly and industriously; and to this end many experiments have been made. A good deal of the value of these experiments will be lost if the kibble to be raised is allowed to come into contact with the sides of the shaft; or if the loading and unloading be slowly or badly managed. These experiments have been made in this country principally by Messrs. Rennie and Walker, C.E., and by mechanicians of great note on the Continent, as, for instance, Gen. Morau, in France, and Prof. Weisbach, in Saxony. Weisbach says that two men can raise a weight of 17 lbs., at a velocity of 2·4 ft. per second, in a pit 40 yards deep, throughout a period of eight hours, which, multiplied by 60 seconds, gives 2448 foot-pounds raised per minute, or 8 tons 12 cwts. 86 lbs. Mr. Walker's calculation is rather different. He supposes two men employed at a windlass raising coal from a depth of 50 yards, as it is done in some districts of Yorkshire and Derbyshire to this day. One man, he says, can exert a force of 12 lbs. at a speed of 220 ft. per minute, and 12 × 220 = 2640 foot-pounds. Then, 2640 × 60 minutes × 8 hours + 2 men × 150 ft. = 7 tons 10 cwts. 96 lbs. raited by the two men in the day. The exercise of a comparative test in this way, where you have a number of men at work, will enable you to know whether they are doing their duty, although practically they will raise nothing of the kind, because they will not be winding all the time, but be called off to perform other duties. It is something, however, to know what can be done, and you can make allowances for all fair and legitimate hindrances, for the nature of the apparatus employed, and the depth from which the mineral has to be raised.

After the windlass and manual labour the horse-whim is the next contrivance that comes into play, and of these there are admirable models in the rooms upstairs. When a trial shaft, for instance, comes to be from 9 to 12 fms. deep, the windlass is put aside, and the miners begin to work with what is called a "whip and derry." This is neither more nor less than a pulley placed over the shaft on a frame more or less lofty to hold the pulley wheel over which a rope is passed. One end of this rope is in the pit attached to the weight to be raised, and at the other, after it is passed over the wheel, a horse is harnessed, and the animal is trained to walk a certain distance along a road laid down for the purpose. A great deal of work is done upon this plan, although it is liable to the disadvantage of the horse having to make a great effort when the weight is lifted from the bottom, and in the same way there is a tendency in making the descent to increase the velocity, so that if the horses are not well trained and steady, there is a great waste of power, and not a little danger. This plan can be recommended only for the temporary sinkings while they are at no great depths. It is a question of importance which sort of pulley is the best for these small workings. They are usually about 2·9 in. in diameter, but I have seen pulleys between 2 and 3 ft. in diameter employed for horse work. The ordinary horse-whim is an apparatus based upon the wheel and axle principle, and, therefore, the power is easily calculated. It is, generally speaking, in the form of a drum, which may be from 8 to 12 ft. in diameter, built round a vertical axis, the foot of which turns on a stone or an iron casting, and the head part of which is supported by a long span beam, resting at the extremities on inclined legs. Attached to this will be an arm or arms, which must be of considerable length, generally from 30 to 36 ft., and it embraces the vertical axis close beneath the drum, which is in coal mining from 12 to 16 ft. in diameter. The ropes, passing off from opposite sides of the drum, are conducted over little guide pulleys called "jackanapes" to the sheaves set in the shaft frame overhanging the pit. These could be worked by hand labour if on a small scale, and when so treated have been found by experiment to be more effective than the windlass. Horse-whims are, however, generally employed, the hand-whim being hardly ever seen except in small experimental adventures in Cornwall. A horse, with a velocity of 2·9 ft. per second, would exert a constant force of 95 lbs. at the extremity of the axle, so that the amount of work done would be 16,530 lbs., raised 1 ft. high per minute. The difference between the results of the simpler kind of horse-whim and the windlass is measured by the fact that the former will, as I have just stated, raise 16,530 foot-pounds per minute, as against 3000 foot-pounds raised by the latter, showing that horse power will produce five times the result of human labour. In the coal districts, as soon as any considerable depth is attained, steam power is invariably introduced, but in Hungary, Spain, and Mexico, where it is difficult to employ water or steam power, the construction of the whims has to be guided by the greater depths to which they are applied, and the larger number of horses thereby required. In Spain horse and mule power are chiefly employed, as the cost of getting weights, machinery, coals, and, perhaps, water up the mountains for steam, would be so great as to outweigh all other advantages. The drums are often made of enormous size, in which case they employ 10 or 12 horses at a time. In Mexico there are fine examples of drums of these large dimensions, where there are vast eight-sided shafts, with a whim placed on each side of the octagon, worked by 12 mules. In Hungary, although the mines are 200 fms. deep, all the mineral has to be raised by the horse-whim. In our own country whims are open to the sky, but in the higher regions on the

Continent they are covered in so as to shelter both horses and men from the extremes of both winter and summer.

A very important point with respect to the work done by wheels, and one which has taxed the ingenuity of engineers, is a good deal related to the respective lengths of the ropes, which might be, for instance, in one case 170 fms. and in the other only 150 fms. To meet this, the drum is often divided into two parts, one of which works by itself, while the other stands still. In these days, when such great weights have to be raised in the shafts, and at such a high rate of velocity, and when the drums are so large that the machinery will raise the weights 40 or 50 ft. at each stroke of the engine, it is necessary to raise the pulleys to a height of from 20 to 30 ft. from the ground. The frames, therefore, have to be constructed with great strength, although with great simplicity, often, as in the midland districts, consisting only of two uprights, with two back legs. The wear of pulley-wheels when the velocity is high is very considerable, and different modes of construction have been tried to lessen it. Thus, Messrs. Newall and Co., whose wire-ropes, and other cognate manufactures, have made their names well known, make an excellent pulley-wheel, with a centre boss and arms of cast-iron, but all the rest of wrought-iron, which being lighter is more suitable for wheels of larger dimensions, the diameter of which is often from 10 to 20 ft. The smaller wheels are from 6 to 9 ft. in diameter, and are usually made of cast-iron.

Great attention must be paid in the application of horse-power to the arrangement of the pulley-frames, so as to render the friction as little as possible; and the same rule applies in a greater degree to water-power. This often has to be brought from a considerable distance, and then the proper diameter of the water-wheels has to be considered. These are commonly from 30 to 40 ft., and fitted with buckets. If the wheel be on a slow axle the drum shaft may be a continuation of the wheel shaft, and so arranged as to move on the circumference of the wheel at a rate of from 6 to 9 ft. per second. If this movement be either slower or more rapid than that, then the full effect of the water falling on the wheel will not be obtained. If the wheel be larger, an intermediate apparatus must be used, for the purpose of reversing the movement, and in that case the wheel is double bucketed. To avoid wheels of this kind, which are of necessity heavy and cumbersome, Mr. Smeaton, the eminent engineer, contrived a system of gearing by which the wheel was made always to revolve in the same direction, and that of the drum only reversed, so that a great waste of power is avoided. One axle, by means of a lever, is simply thrown out of gear, and the other thrown in, so that the drum is turned with the greatest ease in the opposite direction. There are a great many points, however, connected with the application of water-power, and the construction of water-wheels, which we shall have to consider somewhat more in detail, with which the mining engineer ought to be thoroughly acquainted, as circumstances frequently require adaptations of power and different modes of application for which no positive rules can be laid down.

The mineral is raised in what is called a bucket, or kibble (German "Kübel"). These in the olden times were made of wood, hooped with iron, but in England sheet-iron has been used for many years instead of wood, and in the mines of the western districts wrought-iron has been largely adopted, as being calculated to stand a great deal of wear and tear. The shape of these buckets is either circular, as in Saxony, or of an elliptical form. Baskets used to be commonly employed in raising coal, but they are scarcely ever seen in these days. In Belgium, and at certain collieries in the neighbourhood of Bristol and Bath, a kibble of enormous size was in vogue contemporaneously with the buckets, which simply travelled up and down the shaft, and which was conveniently filled by being lowered until its top came opposite the floor of the level, when the material could be thrown in. These were generally constructed to hold 1 or 1½ ton, and on arriving at the surface the mineral was simply shot out on the pit bank, giving rise to the formation of a considerable amount of small coal. A radical change, however, has taken place in these arrangements a nearly the whole of our northern collieries.

THE MINERAL RESOURCES OF NOVA SCOTIA.

Although the importance of the auriferous deposits of Nova Scotia have not hitherto received sufficient attention in England to secure the application of an adequate amount of British capital for their extensive development, it cannot be doubted that Nova Scotia will, perhaps at no distant period, become a very attractive field for capitalists. Comparing the statistics of Victoria (Australia) and Nova Scotia for the past seven years, the proportionate increase in the quantity of quartz crushed will be found to be fully as great in Nova Scotia as in Australia, whilst the average yield of gold during the period has been upwards of 36 per cent. higher; for whilst the Australian quartz averaged but about 11½ dwts. per ton that of Nova Scotia exceeded 15¾ dwts. An abundance of such important facts as these were given in the paper on "Gold Mining and its Prospects in Nova Scotia," by Prof. H. Youle Hind, read before the Society of Arts. The area occupied by the Lower Silurian gold-bearing rocks of Nova Scotia has been variously estimated at from 6000 to 7000 square miles; but since these estimates were made there has been described a series of gneissic rocks, supposed to be the equivalents of the Cambrian and Laurentian, which occupy at least one-half of the area hitherto assigned to the Lower Silurian; and there is good reason for supposing that an auriferous zone will be found in these Nova Scotian gneisses underlying the present gold-bearing series. There is another remarkable source of gold in the conglomerates at the base of the lower carboniferous rocks. The occurrence of gold in this position is highly important and suggestive, but too little is known respecting its distribution to make it a subject for present description or discussion. The districts of Waverley and Sherbrooke have been carefully surveyed, and their geological structure worked out with considerable detail, Prof. Hind having been engaged in the work. There are types of all the known gold districts in Nova Scotia. Waverley occurs with several others in the Silurian valley between two great exposures of gneissic rocks; Sherbrooke is one of many arranged round an island of gneiss.

The strata at Waverley are arranged in the form of a long elliptical dome, tilted over to the north. This form was occasioned by the intersection of two great anticlinal folds, one having a course from east to west, the other from north to south. The east and west fold has a slight overturn to the north. At Mount Uniacke the east and west fold has an overturn to the south, which is also the case at Sherbrooke. The then contemporaneous beds of auriferous quartz or lodes necessarily partook of all the movements to which the associated strata were subjected; hence we find the outcrop of the lodes curving round the axis of the tilted east and west anticlinal in the form of long semi-ellipses where denudation has exposed the edges of this bed. One of the most important lodes in the district is the Tudor, which had yielded 8727 ozs. of gold from 6972 tons of quartz, when the lode was lost. From a study of the structure of the district, the details of which are given in his official report, Prof. Hind indicated the course of the lost Tudor. Operations were commenced late in the autumn of 1868 to discover this lode on the south side of the anticlinal, about 770 ft. from the place where its alleged disappearance had occurred. In January, 1870, it had been traced, and in part worked back to the area where it had been "lost," through a distance on the curve of about 1100 feet, connection with the original lode being broken by a small fault. The mean difference between the ascertained outcrop and the theoretical outcrop is 25 ft. 9 in. in 1100 ft. horizontally. The north lode is also a valuable lode at Waverley. This lode runs parallel to the Tudor on the north side of the anticlinal, and it has also been recently traced, and in part worked, parallel to the Tudor lode on the south side of the anticlinal, through a horizontal distance of 900 feet, the mean difference between the theoretical outcrop and the actual outcrop discovered being 25 ft. 7 inches. The rocks throughout these distances of 1100 and 900 ft. are deeply covered with boulder drift, and of uneven surface, so that he may reasonably claim a closer approximation between theory and fact than a mean difference in outcrop of 25 feet 8 inches over a horizontal space of 2000 feet.

The geological structure of the Waverley gold district being the type of the structure of most of the other known districts, the importance of ascertaining the correctness of the views he had expressed respecting the origin, distribution, and general course of the lodes, and the laws to which they were subjected, acquired some interest, for, if generally true, some mining operations would be much facilitated in a country sometimes deeply covered with drift, clays, and gravels. The Chief Commissioner of Mines, in his official report for the year 1869, gives the strongest testimony in Prof. Hind's support. He says—

"WAVERLEY.—Operations have been carried on in this district by the Lake Major, Rockland, American Hill, and Waverley Gold Mining Companies, and by Mr. Leopold Burkner. The most noticeable feature in this district is the tracing of the southern outcrop of the celebrated Tudor lode, by a series of openings connecting two points 1100 ft. distant, and thus proving the correctness of the views entertained by Prof. Hind, of the geological structure of this district, as described in his report, and fully exemplified in the map accompanying that report. The South Tudor has been now traced for upwards of 1100 ft., and the mean difference between the outcrop assigned by Prof. Hind and the actual outcrop, disclosed by shafts, does not exceed 25 ft. 6 in. throughout that horizontal distance."

Mr. Rutherford, the Provincial Inspector of Mines, also states in his official report for 1869—

"A short distance west of his workings on the Tudor lode Mr. Burkner has sunk a series of shafts on a lode ranging in a somewhat parallel direction with the south or Nigger lode, formerly worked by him. Five shafts are being sunk on this lode, their present depth being about 50 ft., and the lode is taken out by underhand stoping, the entire range of the shafts, with the exception of a bulkhead or divisional piece, 4 ft. thick, which is left in the centre of space between each shaft. The lode varies in thickness from 12 to 5 in.; it dips to the north-west. The trending of the strike of this lode towards the north and east has been followed from the shafts to within a few feet of the old working on the Tudor lode, and its identification with that lode been established, and the construction assigned by Prof. Hind to this part of the Waverley district confirmed."

The barrel quartz at Waverley is a fair representation of a corrugated lode occurring on the crown of an anticlinal. In nearly all the gold districts the same form of quartz beds may be seen, and in similar relative positions. The corrugated structure is not confined to the quartz, but spreads fan-like into the overlying rocks, and appears to be in part the result of unequal pressure during the folding of the strata. In every district in Nova Scotia it is remarked that the gold frequently "runs in streaks"—that is to say, a zone of rich auriferous quartz occupies a certain breadth of the lode, whilst to the east and west of that zone the quartz is compartively poor in the precious metal. It is also found in different districts that the gold streak has a different angle with the horizon, and that sometimes the course of the rich zone corresponds, or is coincident, with the ripples or swells in the lodes, and also that the gold streak varies in direction in different leads. The position and dip of the gold streak being found on one side of the anticlinal, it can be traced to corresponding lodes on the other side, with such variations in dip as agree with the section of the curve of the anticlinal. The term gold streak in Nova Scotia is synonymous with the term chimneys in California and pipes in Australia.

As much misapprehension might arise from the broad statement that all the auriferous lodes in Nova Scotia are sheets of quartz, generally traceable from one side of a tilted anticlinal to the other side, in unbroken continuity, it is necessary to state distinctly that, although the sections exhibit this relation, yet it holds good only with reference to certain lodes which have been so traced, and to groups of lodes. This arises from the structure of the lodes. In many instances they are not continuous for very long distances—that is to say, they "thin out" and "take up" again. In some instances the same lodes can be traced at the surface for many hundred yards, and even for miles, but it is safe to assume that generally, as stated in his report on Waverley gold district, they resemble thin lenticular sheets of quartz, whose edges overlap one another, especially in bands of slate. In making cross-cuts at some distance below the surface lodes are frequently cut which do not appear in the surface trenchers, and in broad bands of slate, lodes thicken to the breadth of 10 to 12 in., and thin out to a flim of quartz, or disappear altogether in the space of a few hundred feet. But before they thin out altogether another lode begins to appear, separated from the first by a few inches, more or less, of slate or quartzite. This cannot be strictly regarded as a continuation of the lode which has "thinned out," although it also may thin out and be in part overlapped by another lode in the strike, and in the place of the first one which had disappeared. Some lodes of this description appear to belong to the class of intercalated lodes—that is to say, they are sheets of quartz which have been formed at a later date than the enclosing rock, and were produced by the replacement, particle by particle, of a pre-existing bed of some other soluble material. In lodes of this class, which generally occur in slate, the slate itself is found to be auriferous, and the whole mass is frequently worth crushing.

The strong persistant contemporaneous lodes, such as the Tudor and North lodes at Waverley, generally occur in quartzite on the one side and slate on the other. The intercalated lodes now frequently occur in slate, and are often associated with thin lenticular beds of slate and quartzite, which also "thin out" and "take up" again. There are, then, in Nova Scotia bedded lodes of the same age as the quartzites and slates with which they are interstratified; the intercalated lodes of subsequent age, the gash lodes, and the true veins, a few of which are worked. Most of the gold is obtained from the bedded and the intercalated lodes. The origin of the intercalated lodes is obscure, but the conditions required for the formation of some of these appear to be in great part satisfied, if we suppose that they represent lines of minimum pressure during the folding, denudation, and faulting of the strata. Along such lines the flow of aqueous currents would be determined, and particle by particle of soluble strata be removed and replaced by other minerals. This would also account for the regular arrangement of crystals of arsenical iron pyrites in slates and quartzites, in certain lines of direction, over wide areas. According to this view, the formation of intercalated lodes is continually going on, for the pressure upon any given point, at any given depth, is constantly changing, owing to denudation and other causes constantly operating, although in no form perceptible to the senses. Some of the Nova Scotian mining undertakings are of a purely speculative character, some have ceased working, others are profitably carrying on the business, but, as shown in succeeding paragraphs, in a very unscientific and wasteful manner. A few are working with comparative economy, but no approach is made to the admirable system which frequently obtains in Victoria, where the best of mining schools—experience—has taught miners to conduct gold mining with the same attention to detail as is thought absolutely essential to success in any other branch of industry.

The reading of the paper was followed by an interesting discussion, in the course of which Mr. Robinson remarked that the Montagne district was remarkable for the very large yield that had been found from the commencement, the yield being equal to 1 oz. 5 dwts. per ton, which was the highest on record. Mr. Arthur Sopwith, who had just returned from Nova Scotia, could to the utmost corroborate the statements made by Prof. Hind, as to the manner in which mining was conducted there. One of the most important points in any large gold-producing country was the treatment of the tailings and arsenical pyrites, from which the gold was more difficult to separate than from any other metals with which it was found combined. I was not exactly within the scope of the paper, which treated principally of the other district, but he might mention that in the Montagne Mine, which was one of the most interesting in the province, and was in the neighbourhood of Waverley, there were found in the foot sole of the lode masses of arsenical pyrites about the size of two fists joined together, at very short intervals, and this really amounted to a considerable portion of the lode, which was only 2 in. thick. It was very probable that this pyrites would give from 80*l.* to 120*l.* per ton, at any rate, if the statements made were anything like correct, as it was in appearance exceedingly rich. With regard to the cost of mining, the Nova Scotian methods of working were very limited; but, on the other hand, it must be remembered that unless sufficient capital were subscribed to carry on operations for a long time it would not pay to erect good machinery and pumping gear, which would have to be abandoned in case of meeting with barren ground. It was the case in all metalliferous mines that a large proportion of barren ground had to be opened, and unless there were plenty of capital a person might be ruined at once by setting up expensive machinery. The fact was not a single mine in Nova Scotia had been started with anything like what would be considered in England a sufficient capital. Not only were there the true beds, but also a great number of cross leads, and at some points the intersections of these cross leads was the richest part of the lode. This was a point which required a good deal of attention, because if the cross lead were struck it might cut through two or three lodes without being cut out, and at all points of intersection it might be very rich. By striking on a length of cross lead, and through the main leads, which, as a rule, lay pretty close together, the work would be found much more productive than trying here and there in a main lode, trusting to chance to get a nest of gold. Dr. Boycott considered that what was wanted for working the Nova Scotian mines was not so much money as more information and skill. Mr. Botly concurred in the opinion that the want of labour-saving machinery, and the imcompetency of the so-called managers, had prevented successful gold mining operations.

As to the continuity of the gold-bearing rock, the Chairman (Prof. Warington Smyth) said that he had on former occasions visited certain localities, though not in Nova Scotia, where it was said that minerals occurred regularly throughout a stratified mass, but he had usually found such a statement to be the result of deficient observation. In a certain part of the stratified-looking mass there had been a dissemination of mineral matter, but very frequently this apparently stratified mass was nothing else but a mass of stratified material, ground and rubbed together, and existing between two walls resembling those of a regular vein; or, again, that the mineral matter had most decidedly intercalated at a period long subsequent to the original formation of the beds. He could not help thinking, in spite of all the excellent accounts which had been brought forward, that this would prove to be the real explanation of the occurrence of the gold in a great part of these Nova Scotian deposits. With regard to the second part of the question, it appeared quite clear that there was, throughout a great part of this district, a sufficiently large proportion of gold extending throughout these quartzose deposits, whether beds or veins, to pay well for mining enterprise.

FOREIGN MINES.

PACIFIC.—Henry Scadden, Union Hill Mine, May 17: Since my last there has been a wonderful improvement in the ore in the western part of the mine, and with a good month's run on the same it will make it very profitable for the company. The eastern part is still improving. No. 3, or bottom level, carries a 2-ft. ledge. No other change in the mine.

Lander Hill Mine.—J. Brown, May 19: In the 550 ft. cross-cut south the ground in the end has very much improved since my last report. I hope to make better progress in future in driving this level. The ground in the 550 ft. level, northwest of engine-shaft, is favourable for driving, and we are making good progress since we resumed. In the 400 ft. level, west of engine-shaft, the lode in the end is 2½ ft. wide, worth 200*l.* per fathom—a splendid lode. The ground in the end and about the lode for the last 100 ft. is everything that can be desired. I think we shall open up a fine mine in this direction.

SWEETLAND CREEK (Gold).—G. D. Maclean, May 12: I received and answered your telegram enquiring for the account of the 13th, and for the next clean up, which will be about the middle of next week. A report will reach you before this note; I write, however, that this may come to hand as soon as possible after the telegram of the clean up. I neglected, I believe, in my note to you, enclosing statement to April 13, to mention that this run would be an expensive one (the telegram announcing the clean up advised a remittance of 1000*l.* on account of profits), owing to the old company neglecting all repairs and improvements, and also letting the sluice tunnel lag behind, in anticipation of the sale. Their last powder-drift also was run to the right of the channel, and consequently the dirt washed this time is hardly average; however, by the time this run is ended we shall have everything straightened out, and I think next time will do well. I saw the ditch owners since I wrote you last, and made a persistent effort for a reduction in water, but to no purpose. Water is selling in other localities adjacent for 8 and 10 cents per inch, and there is no reason why it should not here. I shall keep an eye to this, and try to obtain a reduction somehow; still I can, and will, press the claims on the channel to profit, but could crowd it more with cheaper water. If anything should occur to bring about a reduction in the price our claim would be much enhanced in value, and the profits much larger. I would remark that the result of a clean up, sent by telegraph, will be an approximation, because in advance of the assay.

EXCHEQUER.—Capt. Chalmers, May 9: During the week ending Saturday, the 7th inst., the air-shaft was timbered throughout, as well as the chamber; 12 ft. of drift was made from the 50 east across the lode in the winze. It being imperatively necessary that we should have some better access to the mine for freight, I was obliged to employ some men (who would otherwise have been engaged drifting) to repair as well as possible the path from Silver Mountain up the canon, and I think they will have completed this in about three days sufficiently well to allow of a team getting up within a few hundred feet of the tunnel mouth.

CAPULA (Silver).—May 8: I am happy to inform the directors that we are left quiet again, and it is hoped that the revolution will soon be put down, so that we shall be able to prosecute the works of the mine and hacienda. On the 3d inst. we put the engine to work again, and expect the water will be in fork by the 10th, when we shall immediately resume the driving of San Pablo cross-cut, which, no doubt, in a very short time will drain all the winzes below adit, thereby we shall be able to increase the extraction of good quality ore. As yet we have got only two enginemen, but another has promised to come to-morrow. We have no pitman as yet; at present the timberman is doing the gearing, &c. The men only worked a part of the present week in San Jorge stopes, on account of the feast-days, consequently there is no alteration to note since my last. We shall resume the driving of the Esperanza and San Enrique levels as soon as we receive borer-iron from Encarnacion, which we are daily expecting; we shall also work all the places above adit that will, or are likely to, pay.—Hacienda de Jesus: There is at present in that hacienda 556 cargas of Capula ore. Torta No. 8, of 150 cargas, assay 17 marcs per monton, will be washed this week in time to send the silver by the next conducta on the 18th inst. No. 9, of the same quantity, assayed in the hacienda 16 marcs, the silver from which will be in time for the following conducta. The mine assay for No. 10 is 18 marcs, now grinding; I mention it that the directors may see that the ley is getting up again. We have ordered in lime to go on with San Juan hacienda, and make the most of the dry season.

WEST CANADA.—Capt. Williams, May 17: Huron Copper Bay: The lode in Stephen's winze sinking below the 35, west of Palmer's shaft, is worth 2 tons of ore per fathom. The stope in the bottom of the 20, east of this winze, yields fully 3 tons of ore per fathom. The stope in the bottom of the 35, west of Palmer's shaft, yields 2¼ tons of ore per fathom. The stope below the 20, east of Powell's winze, on the fire lode, yields 2 tons of ore per fathom. The stope below the 35, east of Powell's winze, yields 2 tons of ore per fathom. The stope below the 35, west of Bray's shaft, and west of Bartle's winze, is not changed since last reported on. The pare belonging to this stope have been engaged during the last seven days in putting in a stull, which they have now nearly finished, and will commence to work the stope again in a day or two. The stope below the 20, east of Bray's shaft, and west of Carmichael's winze, yields over 2 tons of ore per fathom. The lode in the 50, west of Palmer's shaft, is looking splendid, and yields 4 tons of ore per fathom. The stope below the 50, west of Palmer's shaft, produces 2 tons of ore per fathom, but we hope it will yield a much larger quantity per fathom after the south part of the lode is cut through. The lode in the 60, west of Palmer's shaft, yields over 2 tons of ore per fathom. We hope soon to see equally as rich a lode in this level as there is at the present time at the 50. The 60, east of Bray's, the lode is much improved in appearance and value since last report; it will produce at this time fully 1 ton of ore per fathom. In Bartle's winze, sinking below the 50, we have done nothing towards sinking this winze since I last wrote you. The men have been and are engaged in raising building stone for the new works, but we hope to start the winze again in the course of a week.—Wellington Mine: The stope east of Rowe's shaft is worth 3¼ tons of ore per fathom. The stope west of this shaft yields over 2¼ tons per fathom. The stope over the 35, east of Bray's shaft, yields 3¼ tons of ore per fathom. This stope is now in the Wellington limits. We commenced to mould bricks on Friday last, and hope to start burning in a few days. We are also making all the speed we possibly can with the foundations, and the raising of building stone for the new works. Yesterday we shipped by the steamer Acadia 1365 barrels of copper ore. Our dressing and everything connected with it is going on satisfactorily.

[For remainder of Foreign Mines see to-day's Journal.]

GOLD MINING IN AMERICA.—The United States Commissioner of Mining Statistics reports the following to have been the yield of gold in the several States during the year 1869:—

California	$20,000,000
Nevada	14,000,000
Oregon and Washington	4,000,000
Idaho	7,000,000
Montana	12,000,000
Colorado and Wyoming	4,000,000
New Mexico	500,000
Arizona	1,000,000
Other sources	1,000,000
Total	$63,500,000

NEW PUMPING-ENGINES.—It is a matter of local pride to notice the production of any improvement in manufactures in our city. The Philadelphia Hydraulic Works have lately completed a peculiar engine for the water works at Newcastle, Delaware. The machinery consists of a pair of pumping-engines, side by side, running in unison, without shaft or fly-wheel. The steam extensions are peculiar, each embracing, under cover of what appears to be a single cylinder, a distinct pair of cylinders, one being only one-third as large as the other. The steam is used first high pressure in the smaller exerting a second force, low pressure upon the piston of the larger. A pair of double-action horizontal air-pumps situated between the engines, and driven by their motion, create a continuous vacuum upon the exhausting ends of the low pressure cylinders. This combination results in the consumption of but a nominal amount of steam. This is a specially new wrinkle in steam machinery, and the engines were designed by Mr. Wm. Henderson, well known also in your city and in South America for his mechanical and engineering talent.—*The Iron Age (New York).*

IRON AND STEEL.—By the invention of Messrs. P. R. HODGE, Adam-street, Adelphi, C. HENGST, Fulham-road, and N. WILSON, Holborn, they prefer to use, and claim as new, a flux composed of calcined borax, (say) 1 oz., combined with essential oil of rosemary, or any of the essential oils, mixed with iron filings or iron powder, made very fine and mixed uniformly with the calcined borax and essential oil. This compound is put on the surface of the materials to be combined together, after being heated to about 240° to 260° Fahr., and then heated up in a close muffle or hollow fire, or a close heating furnace to a red heat.

PUDDLING FURNACES.—Mr. J. HALFORD, Kingswinford, constructs an oven, or combustion chamber, similar in its general form and size to the chamber of the ordinary fire-places; but he makes the bottom of the oven or chamber without fire-bars or other opening for the air, and upon the bottom the fuel to be burnt is supported. The fuel is supplied to the oven or chamber by a hopper at the top, or by an opening at or near the side of the oven. The air for supporting the combustion of the fuel is introduced at an opening in front of the oven or chamber, this opening being at the lower part of the chamber. The fuel is always maintained at such a height as to cover the opening at which the air enters. The whole of the air entering the chamber is thus made to pass through the ignited fuel.

DRESSING STONE.—By the invention of Messrs. D. JACKSON and J. RILEY, Oldham, and G. R. RAY, Dukinfield, the block of stone to be shaped, or dressed, is placed on a table mounted on wheels or otherwise, which is traversed to and fro on a bret-plate by a rack and pinion, or other equivalent. Above the block of stone is a revolving cutter, made by preference with two or more chisels set tangentially in a bolder. This tool-holder is supported in a headstock, to which a to and fro motion is given at right-angles to that of the table by a screw or other equivalent. The tool-holder has also an up and down motion given to it by a screw or otherwise to vary its position according to the size of the block of stone, and to give the required cut to the tools. The tool-holder is turned round by a side shaft and gearing, or by a driving belt acting direct on a pulley on the spindle of the tool-holder.

IMPROVED PUMPING MACHINERY.

FIG. 1.

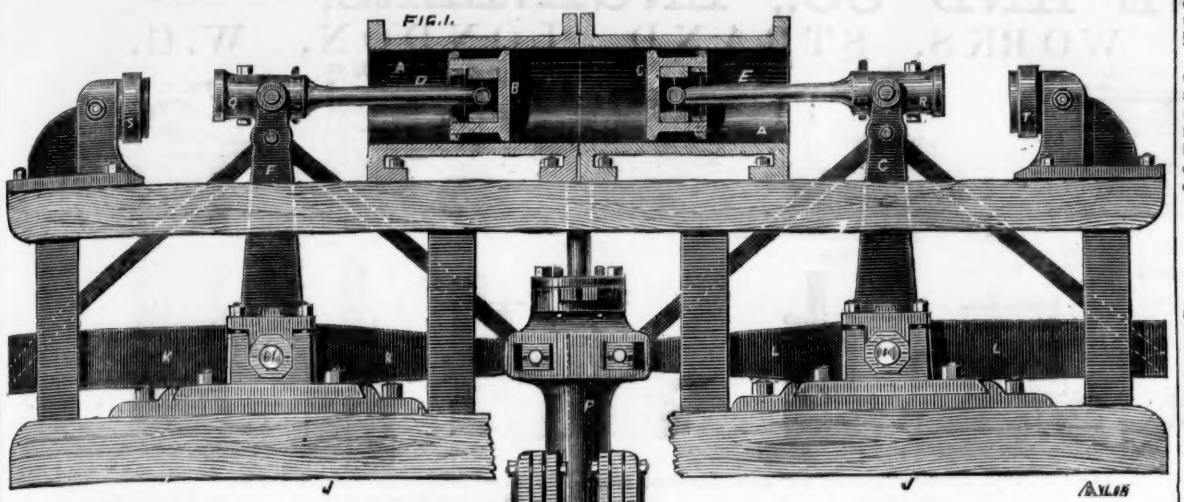


FIG. 2.

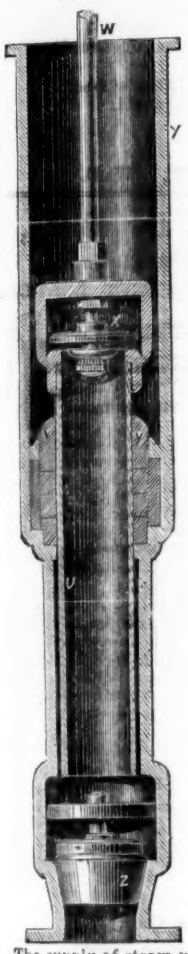


FIG. 3.

FIG. 4.

Some special improvements in engines and pumps have just been patented by Mr. JAS. VIVIAN, of Falmouth, through Messrs. Robertson, Brooman, and Co., Fleet-street. The invention consists, first, in fitting two pistons in one cylinder; these are driven outwards by the action of steam admitted to the cylinder at about the middle of its length. The rods of each piston are connected to vertical arms of rocking frames, free to oscillate on arms or axles. The inner ends of the rocking frames are jointed to a crosshead or coupling plate, capable of having an up-and-down movement imparted to it on a guide-rod. This crosshead supports the ropes or rods by which the plungers are worked. When the steam has driven the pistons the full length of their stroke, the exhaust leading to the condenser is opened, whereby a vacuum is formed. The outer air then acts upon the pistons, and drives them inwards to their first positions, to be again acted upon by the steam, as before mentioned.

Fig. 1 of the accompanying engraving, for which we are indebted to the *Mechanics' Magazine*, shows a sectional elevation of a cylinder A, in which two pistons, B C, are fitted according to this invention. Both pistons are shown at about the middle of their stroke—that is, about mid-distance between the central part of the cylinder and the outer ends. The entrance for the steam into the cylinder may be at any part of the central portion, either at the top, at the sides, or at the bottom, as found most convenient; and its pressure causes both pistons to travel towards the ends of the cylinder at the same time, each piston forming an abutment for the steam to act against. The supply of steam may be cut off at any part of the stroke, so that the quantity admitted may be used expansively or not, as required. When the pistons have travelled a fixed distance, they uncover a port at each end leading to a condenser, so that the cylinder becomes empty. The ends of the cylinder A are open, for allowing the connecting rods D E, which are jointed to them, to follow the course determined by the motion of the vertical arms, F G, pinned to their outer ends. These vertical arms are centred upon journals, H I, within bearings upon a foundation J, and admit of a rocking motion being given to the vertical arm, F G, and the other parts, K L, of the rocking frame, of which they form part, when the pistons are at work. The parts K L, with the tie rods M N, form a compact and strong framing for lifting the pump crosshead or coupling plate P, which is connected to the inner ends of the parts K K, while the parts L L act as a counterpoise, and, from their situation, they assist in bringing the inner ends of the parts K K upwards while the steam is acting upon the pistons. The crosshead P is provided with slots for the blocks of the journals of the parts K K to slide in during the up-and-down movements of the pump plunger. The crosshead P is hollow, and rides upon a fixed guide rod Q, which passes through it, so that it shall work in a straight up-and-down easymanner without any liability to jamb, either in the up or in the down stroke. Both ends of the crosshead are furnished with endpieces, which are screwed down upon them, to retain the lubricated material in place. The lubricant with whch the material is supplied serves to keep the guide rod Q well greased. The outer ends of the connecting rods, D E, are fitted with springs or buffers R R, so that, when the pistons have been driven the required distance, the buffer ends strike against fixed abutments S T, whereby the springs receive the blow or shock which would otherwise be given to the frame, and which, of course, would in a short time prove detrimental to the effective working of the engine and machinery.

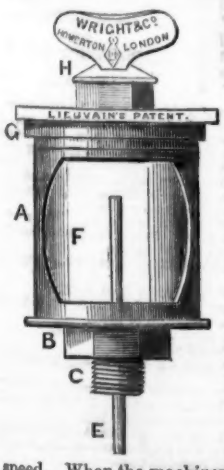
The second part of Mr. Vivian's invention consists in fitting a tube inside the pump barrel; one end of this tube carries a valve on which it finds its seating; the valve is guided in its movements by a stud or pin on which it is free to rise and fall. The upper end of the tube is connected by a bracket or loop to the plunger rod. A portion of the barrel in which the tube works is packed to prevent passage of water from one part to the other. The lower part of the barrel has a valve fitted in it, and as the tube is lifted the lower valve rises from its seat (the upper valve being shut and resting on the end of the tube) by the suction of the tube, the water rises up above the lower valve and fills the space between it and the tube. On the down stroke of the tube the lower valve shuts, and the water from the space lifts the tube-valve and passes up into the space in the pump-head, from which it flows away in the required direction.

This second part is represented in the sectional view Fig. 2. U is the tube, which is fitted inside the barrel V, and receives an up-and-down motion from the rod W. The upper end of the tube is looped, as shown, for the rod W to be connected to, and also to retain the upper valve X in place. The stem of the valve rides in an aperture formed in the loop, so that the valve is guided into position both in the up and down stroke of the tube U. The barrel in which the tube works is packed, and, to facilitate the packing being got at, a cover or plate, Y, is fitted on one face of the barrel; this plate is secured by screw bolts as shown. Below the tube U, and in a recess formed in the barrel is a valve Z, which has an up-and-down movement imparted alternately to it by the suction and the back pressure of the water. This mode of constructing pumps is applicable to all kinds of pumping apparatus, and may be employed in pumps which work horizontally as well as in those which work vertically.

Mr. Vivian's invention consists, thirdly, in fitting balls or lumps on the ends of the wire-ropes by which the plungers of the pumps are worked. These balls may be formed of metal secured to them by soldering, or they may be formed of solder. The ropes are connected to the plunger and to the cross-heads or coupling plate by fixing the balls between plates formed with recesses to receive them, which plates are firmly clamped by bolts and nuts. Fig. 3 is a view of the end of a rope, with balls or lumps, *a a*, formed on it. These lumps are received in recesses formed for them in the inner faces of the plates *b b*, which are firmly bolted together by bolts being passed into the holes *c c c*, as seen in Fig. 4. If it is desired to connect the ropes to the crosshead direct, the recesses for the lumps are formed in one or more of the faces of the same, as shown in Fig. 1, and plates similarly recessed are secured over them. These lumps may be made by bulging the rope out at the required part, by placing loose pieces of metal under and between the strands, or loose pieces of metal may be secured on the ropes by solder. This way of connecting ropes for mining and other purposes will be found of great service in repairing broken or overstrained ropes, or ropes in which weak places are found.

THE NEEDLE LUBRICATOR.

During the past few years an ingenious little instrument has been very extensively introduced in connection with every class and size of machinery, from a sewing-machine to a marine engine. The simplicity of the arrangement is marvellous, whilst its action is as near as may be perfect. The needle lubricator, in its most simple form, consists merely of a small glass bottle, or globe, with a perforated stopper, through which a needle passes, to connect the interior of the bottle with the shaft to be lubricated. The stopper is made of wood, and the needle-rod is a few inches of an ordinary knitting needle, which latter passes through a metallic tube of such a size as to permit the passage of the required quantity of oil between the tube and the needle. The apparatus is filled with oil, and turned neck downwards, and the lower end of the stopper is fitted to, or if necessary pared down to fit, the oil-hole over the bearing of the shaft; the needle alone descends, and comes into contact with the parts requiring to be lubricated, the least movement of which produces an oscillation or vibration of the needle, which disengages a small portion of oil, and causes it to descend from the globe, the quantity being in proportion to the speed. When the machinery stops, or is not in motion, no oscillation of the needle takes place, and the pressure of air at the base of the tube, also the partial vaccuum formed in the globe, prevents the oil from descending until the machinery is again set in motion.



The fact of more than 2,200,000 of the needle lubricators being at present in operation is some evidence of the extent to which the invention is appreciated; and a modification, the object of which is to make the lubricator a substantial and permanent fitting, has been registered by Messrs. WRIGHT and Co., of Homerton (the authorised agents for Lieuvain's patent), of which a diagram is annexed. In the modified arrangement, which is especially adapted for marine and locomotive purposes, A is a gun-metal casing; B, hexagon rod for fixing in place; C, screwed continuation of nut; E, metal needle rod; F, glass cylinder secured in the gun-metal casing by leather washers top and bottom, and tightened by the screwed cap G, which, if by accident broken, can be replaced by unscrewing the cap; and H is a thumscrew for charging the lubricator with oil while in place. This improvement and application, sanctioned by the patentee, is considered by Messrs. Wright to be indispensable for every bearing subject to vibrating or centrifugal motion, which would serve to displace the ordinary glass lubricator above described. When these lubricators are used for crank-pins, connecting or coupling rods, care should be taken that the needle-rod should have but little play. It is necessary for this purpose that it should be of such a length that it will not allow more than ¼ inch, or at great speed even 1-16th inch, between the needle and screw, the other end of the needle touching the journal, as the quantity of oil supplied in this case depends on the course the needle is allowed to travel in an upward and downward motion, occasioned by the throw of the crank.

When required for the slide motion, or motion bars of horizontal engines, the needles are made with a thread cut on the upper part and two lock nuts (as shown in small diagram), which regulate the length that the needle passes through the guide bars. It is necessary that the edge of the block should be rounded off at that part where the needle touches it, so that by its backward and forward motion it will lift it each time, thus causing the oil to flow in the required quantity, otherwise the needle would be cut off, and the action of the lubricator destroyed. It is found that allowing the needle to pass from one-sixteenth to one-eighth of an inch is sufficient, but care must be taken that the screwed part of the needle should not extend more than one-quarter of an inch below the lock nuts, as the jumping motion acquired by the lifting of the needle by the backward and forward motion of the block would cause the small part of the tube through which it passes to become too large, and allow too much oil to flow.

The economy of the needle lubricator in saving of oil is incredible, and all that is necessary is to see that the needles are clean, and free from rust, before putting the lubricator to work. Should the oil descend too freely, in consequence of the lubricator being fixed in a high temperature, or other cause, the needle rod should be replaced by a thicker one; and if the oil be supplied too slowly, either the needle should be slightly filed on one side, or a thinner one substituted.

MINING, METALS, AND MINERALS—PATENT MATTERS.

BY MICHAEL HENRY,
Patent Agent and Adviser, Memb. Soc. Arts, Assoc. Soc. Eng.

Messrs. EUSTACE WIGZELL and JOSEPH POLLIT (Timothy Bates and Co.), of Sowerby Bridge, Yorkshire, engineers and millwrights, have obtained a joint patent for metallic pistons for steam-engines and in their manufacture. This invention relates to the metallic pistons commonly called or known as "Mather and Platt's pistons," wherein helical or spiral metal springs are used. Heretofore these rings have been manufactured by first casting a cylinder of metal, and then turning, cutting, or chasing it in a lathe to the helical or spiral form required. Now, the improvements consist in casting the said helical or spiral springs to the proper form and size ready for use (without having to turn, cut, or chase them afterwards to the form required), thereby retaining or keeping the crust of the cast-metal thereon, which will make the spring or ring more durable and elastic, and not so liable to corosion or eating away by the condensed water and steam; also the cost of manufacture will be considerably less, besides effecting a saving of time in accomplishing the result. The means or apparatus employed for the manufacture or casting of these springs are as follows:—A cylinder is prepared or an outer shell, and a core of the size required by ordinary loam moulding apparatus, and when dry the core is taken (by preference) and fixed upon a table, or face plate, or upon a mandrill, to which rotary motion is given, and by means of a tool, having a slide motion given to it at a suitable relative speed to the table face, plate, or mandrill, a spiral groove of the size and form required is cut out of the loam; or the outer shell may be placed upon the table or face plate, and cut the groove therein instead of the core if desirable. The parts of the mould are then put together, and cast in the manner usually employed.

Messrs. J. BOTTOMLEY and W. BOTTOMLEY, of Bramley, near Leeds, have obtained a joint patent for an invention relating to machinery for fulling or milling woolen and other woven or felted fabrics. The invention relates to certain novel arrangements and combinations of machinery, whereby is obtained a double-acting or compound machine, capable of doing a much greater amount of work, and in a more satisfactory manner, than by machines of the ordinary construction. Machines as heretofore constructed when in operation have always a large quantity of the fabric lying at the bottom of the machine after it leaves the confining spout, causing not only a great loss of time, but also the fabric "goes back." Now, by the following improvements these defects are obviated:—On two suitable frames of iron or other material are placed (by preference) two pairs of rollers or cylinders, of iron or other material. The upper of each of the pairs of rollers or cylinders are mounted in bearings adjustable in the direction of the lower of the pairs of rollers or cylinders. Pressure may be applied to the said rollers by levers and weights, or other mechanical means. In front of each of the pairs of rollers or cylinders is placed a confining spout of ordinary construction. Two lifting boards are also used, which may either be of ordinary construction, and to work independently of each other, or so connected as to move simultaneously. The lifting boards are connected with a self-acting, throwing-off motion, whereby the belt is moved on to the loose pulley, and the motion of the machine stopped when any knot, or irregularity of any kind, attempts to pass through the lifting boards. Behind each of the pair of rollers or cylinders is mounted a small roller of wood, or other suitable material, to guide the cloth to the lifting boards. At the end of each of the confining spouts they fix a guide to conduct the fabric as it leaves the confining spouts from one side of the machine to the other. The machine is driven from one pulley, and power may be obtained by suitable gearing. The two rollers of each of the pairs of rollers are geared together, whereby motion given to one roller is transmitted to the other. The upper and lower rollers of the pairs of rollers may also be connected by gearing. The whole machine may be covered in the ordinary manner with wood, or other suitable material. The ends of the frame and casing are curved in such a way that the fabric under operation may fall nicely to the bottom without becoming entangled.

Mr. ALFRED MINTON, of Kossuth-terrace, Victoria Park Station, has specified an invention relating to electro-coating iron and other metals. To carry out this invention the metal with which the iron or other metal is to be coated, such as tin, lead, zinc, or other metal or alloy of metals, is dissolved in hydrochloric, or sulphuric, or other acid, in the case when iron is to be coated with tin or zinc. It is preferred to employ hydrochloric acid in a purer state than the ordinary muriatic acid of commerce. The solution of a metallic salt thus obtained is diluted with water in the proportion of about one quart of metallic solution to 100 gallons of water. The vessel in which the dilluted solution is contained is by preference formed of, or lined with, earthenware. The metal to be coated, after having been previously pickled in the ordinary manner, is placed in the bath, and is supported therein by preference by pegs or rods of earthenware, and a jet of steam is admitted at the bottom of the bath. Steam is by preference taken from a steam-boiler at a pressure of about 20 lbs. to the inch. When the metal is sufficiently coated it is taken out and rapidly dried, either by placing it on a highly heated chamber; or in the case of sheets of metal, they may be dried by passing them between highly heated rollers, or other means may be adopted for rapidly drying the metal.

Mr. O. L. HOPSON, of Waterbury, United States, has obtained a patent for machinery or apparatus for reducing the diameter of wire or rods for wire drawing, and for other like purposes. This machinery or apparatus consists of a rectangular frame, within which two dies are supported and work, the acting edges of the dies meeting in the middle of the frame, the opposite edges being connected with the frame, so as to be capable of turning somewhat in the manner in which the flaps of double doors open and close in their frame. On the acting edges of the dies semicircular depressions are made, those in one die being opposite to those in the other die, each pair of the said depressions constituting when the dies are closed a circular opening, similar to one of the holes in an ordinary draw plate. The holes in the dies are smaller at the front or acting face of the dies, and expand from the said face backward to the other or back face of the dies. The dies can only open in one direction, that is in a direction from the back towards the front or acting face of the dies. The said dies are pressed into their closed position by a strong spring, and a stop or stops limit their return motion. In order to reduce the diameter of the end of a wire or rod, the said wire or rod is introduced at the back face of the dies and pushed forward. Being unable to pass through the front face of the dies, the said wire or rod presses open the dies, and thereby temporarily enlarges the opening between them, through which opening the wire or rod can now pass. When a sufficient length of the wire or rod has been passed through the front face of the dies the said wire or rod is drawn backwards, or in a direction opposite to that in which it was introduced, when it closes the dies, the said dies gripping the wire or rod between them. By continuing the motion of the wire or rod, the end protruding through the front face of the dies is drawn through the opening by which the wire or rod is gripped, and the diameter of that part is reduced by a drawing action, similar to that of the ordinary draw plate. One or any required number of holes of different sizes may be made in the edges of the dies. The invention may also be used for reducing the diameter of the ends of screws, and for various other purposes.

GWYNNE AND CO., ENGINEERS,

ESSEX STREET WORKS, STRAND, LONDON, W.C.

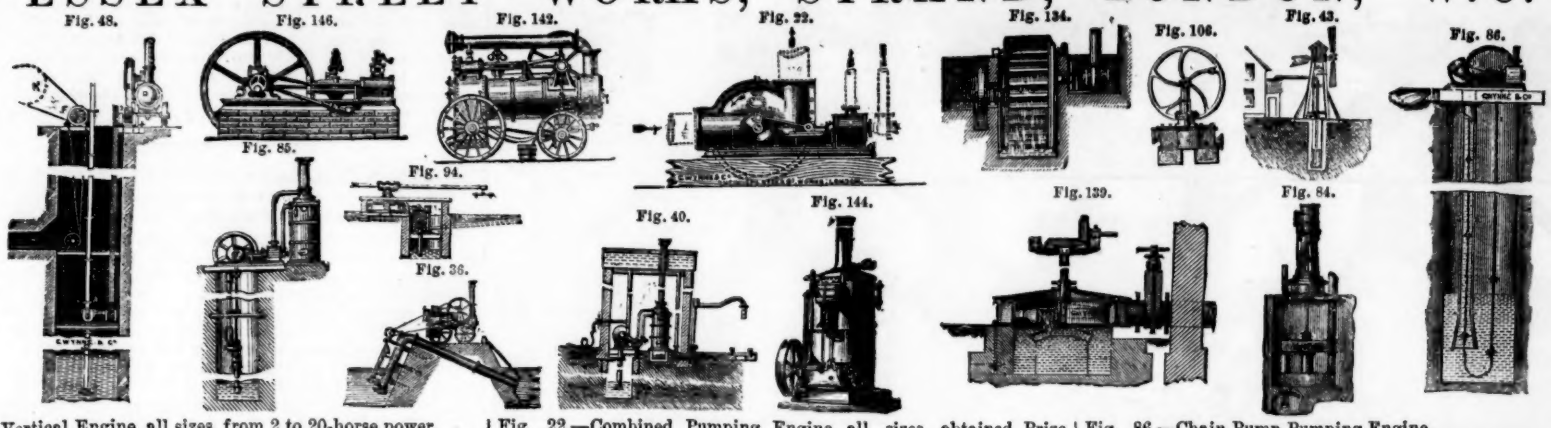


Fig. 144.—Vertical Engine, all sizes, from 2 to 20-horse power.
Fig. 146.—Horizontal Engine, from 4 to 100-horse power.
Fig. 142.—Portable Engine, from 2½ to 30-horse power.
Fig. 40.—Gwynne and Co.'s Combined Stationary Pumping Engine.
Fig. 139.—Turbine Water-wheel, from 1 to 300-horse power.

Fig. 22.—Combined Pumping Engine, all sizes, obtained Prize Medal, Paris Exhibition.
Fig. 85.—Deep Well Pumping Engine, all sizes.
Fig. 134.—Water-wheel Pumping Machinery.
Fig. 36.—Gwynne and Co.'s Patent Syphon Drainage Machinery.
Fig. 95.—Horse-power Pumping Machinery.

Fig. 86.—Chain Pump Pumping Engine.
Fig. 48.—Deep Mine Centrifugal Pumping Machinery.
Fig. 84.—Double-acting Vertical Pumping Engine.
Fig. 106.—Gwynne and Co.'s Improved Plunger Hand Pump.
Fig. 43.—Wind Power Pumping Machinery.

Steam Engines of all kinds and sizes, Hand and Steam Fire Engines, Water Wheels, Hydraulic Lifts, Cranes and Jacks, Steam and Water Valves, Hydraulic Presses, Sheep Washing Machinery, &c., &c.

List of Centrifugal Pumps, two stamps. Illustrated Catalogues of Pumping Machinery, six stamps. Large Illustrated Catalogue, with many Estimates, &c., twelve stamps. All post free.
GWYNNE and Co. have recently effected a considerable reduction in their prices, being determined to supply not only *the best* but *the cheapest* Pumping Machinery in the world.

GWYNNE AND CO.,

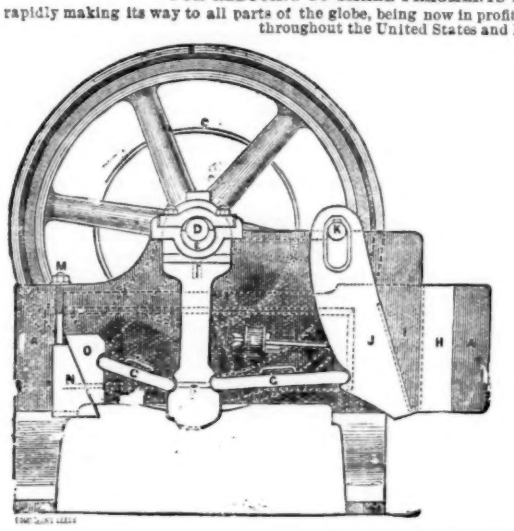
HYDRAULIC AND MECHANICAL ENGINEERS, ESSEX STREET WORKS, STRAND, LONDON, W.C.

IMMENSE SAVING OF LABOUR.
TO MINERS, IRONMASTERS, MANUFACTURING CHEMISTS, RAILWAY COMPANIES, EMERY AND FLINT GRINDERS, McADAM ROAD MAKERS, &c., &c.

BLAKE'S PATENT STONE BREAKER,

OR ORE CRUSHING MACHINE,
FOR REDUCING TO SMALL FRAGMENTS ROCKS, ORES, AND MINERALS OF EVERY KIND.

It is rapidly making its way to all parts of the globe, being now in profitable use in California, Washoe, Lake Superior, Australia, Cuba, Chili, Brazil, and throughout the United States and England. Read extracts of testimonials:—



The Parys Mines Company, Parys Mines, near Bangor, June 6.—We have had one of your stone breakers in use during the last twelve months, and Captain Morcom reports most favourably as to its capabilities of crushing the materials to the required size, and its great economy in doing away with manual labour.
For the Parys Mining Company, JAMES WILLIAMS.

H. R. Marsden, Esq

Ecton Emery Works, Manchester.—We have used Blake's patent stone breaker made by you, for the last 12 months, crushing emery, &c., and it has given every satisfaction. Some time after starting the machine a piece of the moveable jaw s about 20 lbs. weight, chilled cast-iron, broke off, and was crushed in the jaws of the machine to the size fixed for crushing the emery.
H. R. Marsden, Esq. —— THOS. GOLDSWORTHY & SONS.

Alkali Works, near Wednesbury.—I at first thought the outlay too much for so simple an article, but now think it money well spent. WILLIAM HUNT.

Welsh Gold Mining Company, Dolgelly,—The stone breaker does its work ad mirably, crushing the hardest stones and quartz. WM. DANIEL.

Our 15 by 7 in. machine has broken 4 tons of hard whinstone in 20 minutes, for fine road metal, free from dust. Messrs. ORD and MADDISON,
Stone and Lime Merchants, Darlington.

Kirklees Hall, near Wigan.—Each of my machines breaks from 100 to 120 tons of limestone or ore per day (10 hours), at a saving of 4d. per ton.
JOHN LANCASTER.

Ovoca, Ireland.—My crusher does its work most satisfactorily. It will break 10 tons of the hardest copper ore stone per hour. WM. G. ROBERTS.

General Frémont's Mines, California.—The 15 by 7 in. machine effects a saving of the labour of about 30 men, or $75 per day. The high estimation in which we hold your invention is shown by the fact that Mr. Park has just ordered a third machine for this estate. SILAS WILLIAMS.

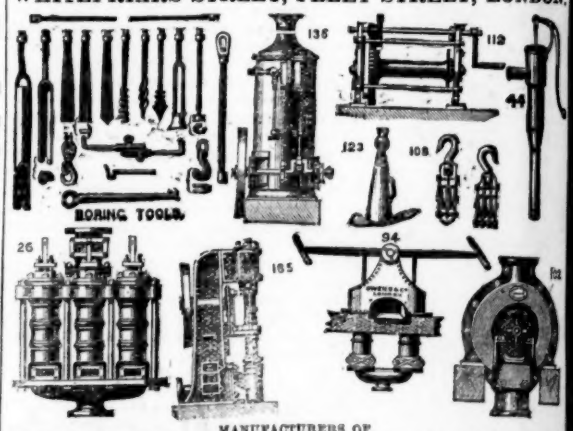
For circulars and testimonials, apply to—

H. R. MARSDEN, SOHO FOUNDRY,

MEADOW LANE, LEEDS,
ONLY MAKER IN THE UNITED KINGDOM.

S. OWENS AND CO.,

Hydraulic and General Engineers,
WHITEFRIARS STREET, FLEET STREET, LONDON.

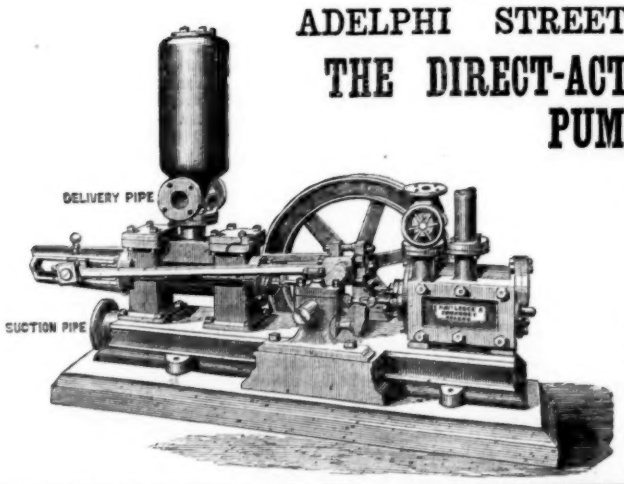


MANUFACTURERS OF
BORING TOOLS, for testing ground for Minerals. Bridge Foundations, Artesian Wells, &c., to any depth.
No. 26.—Treble Barrel and other Deep Well Pumps.
No. 136.—Vertical and other Portable Steam-engines.
No. 185.—Horizontal and Vertical Steam Pumping-engines.
No. 112.—Single and Double-purchase Crab Winches.
No. 108.—Pulley Blocks of all sizes.
No. 123.—Bottle and other Lifting Jacks.
No. 94.—Double-barrel Pumps, for Mine or Quarry use
No. 44.—Portable Wrought-iron Pumps, ditto ditto
No. 102.—Bernays's Patent Centrifugal Pumps, of all sizes.
ALSO EVERY OTHER DESCRIPTION OF
HYDRAULIC AND GENERAL MACHINERY,
COMPRISING
TURBINES, WATER WHEELS, WIND ENGINES, THE HYDRAULIC RAM, FIRE ENGINES, &c.
Catalogues and Estimates on application.

OMMANNEY AND TATHAM,

(LATE ROUTLEDGE AND OMMANNEY),
ENGINEERS,
ADELPHI STREET, SALFORD, MANCHESTER,
THE MAKERS OF

THE DIRECT-ACTING DOUBLE HORIZONTAL PUMPING ENGINE.



THESE PUMPING-ENGINES are especially adapted for FORCING WATER OUT OF MINES, being simple in construction and reliable. They have now been at work many years in collieries, &c., and given every satisfaction.

PUMPS AND
WINDING ENGINES

Especially designed for colliery purposes; also, AIR-COMPRESSING ENGINES, as used in connection with COAL-CUTTING MACHINES, &c.

Further information and prices forwarded on application.

O. and T. are also MAKERS of other classes of PUMPS and WINDING ENGINES.

M'TEAR AND CO.'S CIRCULAR FELT ROOFING,

FOR
GREAT ECONOMY
AND
CLEAR WIDE SPACE.

For particulars, estimates, and plans, address,—
M'TEAR & CO.,
20, BUDGE ROW, CANNON STREET, LONDON;
54, PORTLAND STREET, MANCHESTER;
OR,
CORPORATION STREET, BELFAST.

The above drawing shows the construction of this cheap and handsome roof now much used for covering factories, stores, sheds, farm buildings, &c., the principals of which are double bow and string girders of best pine timber, sheeted with ½ in. boards, supported on the girders by purlins running longitudinally, the whole being covered with patent waterproof roofing felt. These roofs so combine lightness with strength that they can be constructed up to 100 ft. span without centre supports, thus not only affording a clear wide space, but effecting a great saving both in the cost of roof and uprights.
They can be made with or without top-lights, ventilators, &c. Felt roofs of any description executed in accordance with plans. Prices for plain roofs from 30s. to 60s. per square, according to span, size, and situation.
Manufacturers of PATENT FELTED SHEATHING, for covering ships' bottoms under copper or zinc.
INODOROUS FELT for lining damp walls and under floor cloths.
DRY HAIR FELT, for deadening sound and for covering steam pipes, thereby saving 25 per cent. in fuel by preventing the radiation of heat.
PATENT ASPHALTE ROOFING FELT, price 1d. per square foot.
Wholesale buyers and exporters allowed liberal discounts.
PATENT ROOFING VARNISH, in boxes from 3 gallons to any quantity required, 8d. per gallon.

A SAVING OF ABOUT FIFTY PER CENT.

Is effected by the use of the PATENT DON LUBRICATING OIL.

ECONOMIC LUBRICATING — THE DON — OIL.

In place of OLIVE and other kinds ordinarily used on STATIONARY, LOCOMOTIVE, MARINE ENGINES, and MACHINERY of all kinds, and the undersigned are so satisfied of the correctness of this statement, that they are willing, at their own risk, to forward a cask of about 30 gallons for trial to any respectable person or company, on the understanding that it may be returned in a month if it should not answer, when payment would not be required, except for the quantity used.
There are two kinds,—the medium for engines and heavy bearings, and the light for spindles and light work. This oil will lubricate as well, and lasts as long, as olive, neats'-foot, and other expensive kinds, and is superior to rape, which is fully 50 per cent. dearer.
It never "CLOGS," nor leaves any "GUMMY" deposit upon the bearings, which, therefore, never require cleaning or scraping, whereby much time, labour, and expense are saved. It is in use and approved of by the majority of the iron and coal companies in West Lancashire, where it was first introduced but a few months ago, also by several ocean steamer and ferry proprietors on the Mersey and elsewhere.
Printed particulars and testimonials sent, post free, to any address.

DUNCAN BROTHERS, 17, Unity-buildings, Lord-street, Liverpool.

THE NEWCASTLE CHRONICLE AND NORTHERN COUNTIES ADVERTISER. (ESTABLISHED 1764.)
THE DAILY CHRONICLE AND NORTHERN COUNTIES ADVERTISER.
Offices, 42, Grey-street, Newcastle-upon-Tyne; 50, Howard-street, North Shields; 195, High-street, Sunderland.

London: Printed by RICHARD MIDDLETON, and published by HENRY ENGLISH (the proprietors), at their offices, 26, FLEET STREET, E.C., where all communications are requested to be addressed.—*June* 11, 1870.